FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

No. 391. (No. 25, Vol. VIII.)] JUNE 22, 1916. [Weekly, Price 1d. Post Free, 1½d.

Flight.

Editorial Office: 44, ST. MARTIN'S LANE, LONDON, W.C.

Telegrams: Truditur, Westrand, London. Telephone: Gerrard 1828.

Annual Subscription Rates, Post Free.

United Kingdom ... 6s. 6d. Abroad ... ... 11s. 0d.

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TO OUR READERS.

The Supply of "FLIGHT." Important Notice.

Order "FLIGHT" to be either delivered or reserved for you regularly.

As the demand for "FLIGHT" is so great each week, it is of the utmost importance that readers should place their orders *firmly* for copies of "FLIGHT" at the bookstalls, their newsagents, or direct from the publishers, at 44, St. Martin's Lane, W.C., if they wish to secure a copy every week and avoid disappointment. The stringent Government restrictions in regard to the supply of printing paper necessitates this precaution in order that only actual numbers required are printed, and all wastage by unsold copies may thereby be reduced to a minimum, if not eliminated.

THE PUBLISHERS.

EDITORIAL COMMENT.

CONSIDERING that the U.S.A. was the first nation in the world to witness power-driven flight on a heavier-than-air machine, that country may be said to have been somewhat slow in realising, from a national point of view, the potential possibilities of the Wright brothers' invention. Private enterprise has not been lacking, it is true, but it appears to have required the drastic demonstration of the European war to bring home to the Government of a nation credited with a preference for being always ready to try anything new, even the elementary importance of treating aeronautics as a national problem. The drag upon the movement to accept aviation as a serious factor in the world's progress has been as heavy, if not heavier than with our own Government before the present war. This in spite of stupendous efforts on the part of the comparatively few enthusiasts in America to stir up the U.S. Government to action. The persistent work of the Aero Club of America in this connection can hardly be over-rated, but a good deal still remains to be done before the vital character of aeronautics is realised in its fullest measure officially. To a small extent the complications with Mexico have forced the hands of the U.S. Executive, and enabled the American Aero Club to point the moral for more energetic action. They have carried their agitation to considerable lengths, and have bombarded so continuously the members of both Houses of Congress with facts and figures demonstrating the necessity for making ample provision in the Army Appropriation Bill for the expansion of the aerial arms, that no individual representative can claim ignorance of the urgency of the case. Curiously in a communication addressed by the Club to ourselves under date of May 27th, in which they drew special attention to an issue of the *New York World*, which was delivered to the National Capitol, Washington, by aeroplane, dealing with this campaign for the U.S. Aerial Service, the very high opinion which the late Earl Kitchener entertained of the value of aviation emerges very prominently. In fact, the message therein published, which must have been sent only shortly before the hideous disaster which deprived this country of his services, is far and away a more impulsive

Aeronautics in the United States.

expression of the late Minister of War's views, than has ever been allowed to transpire on this side of the water. In the special edition of the *New York World* referred to, appears a cablegram received by the fifteen Canadian aviation students being trained at Newport News, Va., from Earl Kitchener declaring that "one aviator is worth an Army Corps." Such a valuation from such a source of the part being played by our aerial arm in military consideration is indeed encouraging. In commenting upon this message of encouragement, Mr. Alan R. Hawley, the President of the A.C. America, rightly claims that "this proves that we were modest in our estimate that a trained aviator is worth one thousand soldiers in the Mexican campaign. Had we had one hundred aviators at the Mexican border the history of the Mexican trouble would undoubtedly read quite differently."

Not only is the message helpful to the American organisations in their efforts to push aviation to the front in the U.S., but it is also heartening to those on this side, inasmuch that it cannot have but a still further strong influence in consolidating the organisation of our own aerial arm, whilst every move forward by the American Government is a direct incentive for us this side to go one better all the time.

In the world missionary aviation work being done, the A.C. of America may fairly claim in their behalf that it is largely due to their campaign that a U.S. National Advisory Committee for Aeronautics was appointed some time back. It is due to this committee that a great deal of preliminary investigation work has been accomplished, and a *résumé* of some of their endeavours is to be found in their first annual report, which has recently been published in America.

In view of the absence of a national laboratory the investigations have naturally been somewhat fragmentary, as the various tests and experiments have had to be undertaken by different institutions, but this first report contains, nevertheless, much that is of value to the student of aeronautical science, on this as well as on the other side of the Atlantic.

In the four-foot wind tunnel of the Massachusetts Institute of Technology some experiments were made on a $\frac{1}{8}\frac{1}{1}$th scale model of a Curtiss military tractor biplane, type J. N. 2. As the tunnel and aero dynamical balance for measuring the various forces acting on the model are duplicates of the installation at our own National Physical Laboratory at Teddington it will be appreciated that the work in the States is being carried out upon essentially sound lines. The model was tested for longitudinal stability in a wind current of a velocity of 30 m.p.h. The main object of the tests was to obtain data for the calculations of the "derivatives" needed in the complete theory of the longitudinal stability in still air, and the investigations were preliminary to a discussion of the effect of wind gusts. It was found that the model tested, which may be said to be fairly typical of a two-seater tractor biplane, was only longitudinally stable at high speeds, or, in other words, that the stability falls off rapidly as the speed decreases or the angle of attack increases. The instability at low speeds takes the form of an oscillation in pitch, combined with a change in forward speed and a rising and sinking of the whole machine, which, therefore, follows an undulatory flight path. The period of the undulation is about 12 seconds, and the amplitude doubles itself in less than 20 seconds. From the results of the tests it appears that while the particular machine tested is very stable longitudinally at high speeds, if the speed falls below 47 m.p.h. it becomes unstable. This must not be taken to mean that the machine is unsafe at the lower speeds, but simply that the pilot will have to use his controls in order to prevent the machine from reaching a point carrying with it a great amount of pitching.

In Part II of the first report Professor Edwin Bidwell Wilson, of the Massachusetts Institute of Technology, indicates a general method, based on the theory of small oscillations, whereby the equations of motion of a stable aeroplone, whether free or constrained to fly without pitch, whether in steady or gusty air, may be completely integrated in such form that, after a certain amount of preliminary calculation, the effect upon the motion of a large number of different gusts may be determined with relative ease. The types of gusts for which the actual determinations have been carried through are head-on-gusts, up gusts, rotary gusts, rear gusts and down gusts.

In report No. 2 on investigation of Pitot tubes, by the United States Bureau of Standards, W. H. Herschel deals with the Pitot tube and other anemometers for aeroplanes, while in Part II of the same report E. Buckingham goes into the theory of the Pitot and Venturi tubes.

To the average reader, perhaps the most interesting and instructive portion of the report is that on investigations of aviation wires and cables, their fastenings and terminal connections, by John A. Roebling's Sons Co., of Trenton, N.J. These experiments included solid wire stays, stranded stays consisting of either 7 or 19 wires stranded together, cord or rope stays consisting of seven strands twisted together forming a rope, the strands being either 7 or 19 wires. The tests on solid wire stays were made with a great variety of terminal connections and fastenings, and a form was found which gave an average efficiency of 94 per cent. In this connection the interesting and inexplicable fact was revealed that a left hand oval spring wire ferrule gave a five per cent. greater efficiency than a right hand one.

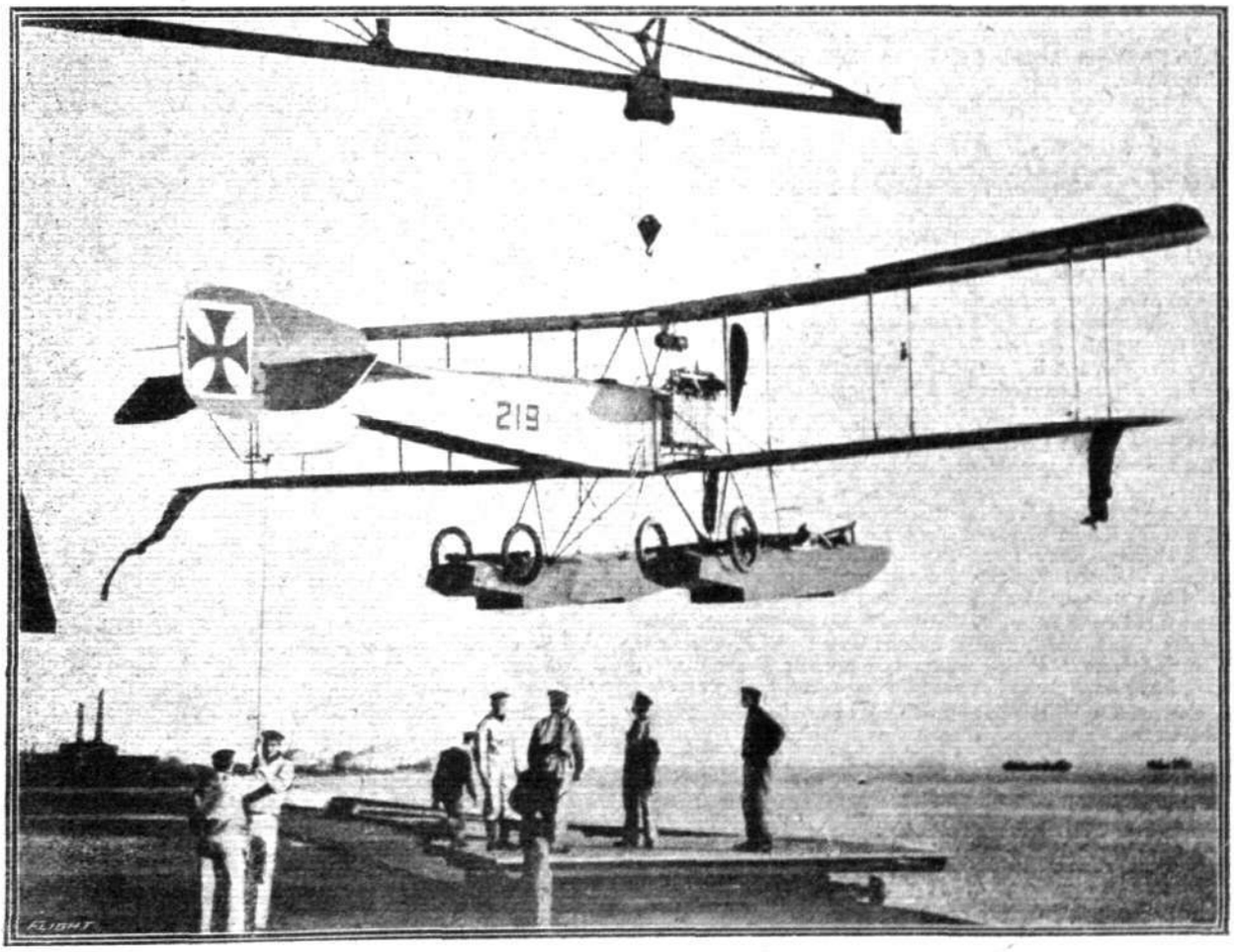
In the tests on the various strands and cords it was found that breakage occurred in every case, when tested to destruction, at the last tuck in the splice, and never around the thimble. This has, we believe, been found to be the case in practice over here. For the smaller diameter cables, that is to say cords up to $\frac{1}{2}$-in. diameter and strands up to $\frac{5}{16}$-in. diameter, the eye splice appears to give satisfactory results, while for larger diameters a socket attachment is necessary to give a high efficiency.

The Goodyear Tyre and Rubber Co. have contributed a report on the relative worth of improvements on fabrics, while the United States Rubber Co. have carried out investigations of balloon and aeroplane fabrics, the results of these investigations being contained in two reports, of which the first, by Willis A. Gibbons and Omar H. Smith, deals with the materials used for aeroplane and balloon fabrics, strength, stretching, and ageing tests, fire-proofing, &c., while the second, by Willis A. Gibbons, contains the results of experiments made in the wind tunnel of the Washington Navy Yard on the frictional resistance of various surfaces. Plate glass was used as a standard, or ideal surface. It was found that by doping and varnishing the fabric it was possible to obtain a smoothness approaching to that of glass, and, therefore, of proportionally small resistance. That the smoothness of the fabric is not a matter of negligible importance may be realised when it is pointed out that the difference in resistance between an uncoated fabric and plate glass is very appreciable at high speeds, being about 0·013 lb. per sq. ft. at 70 m.p.h. This would mean a total head

resistance in a large machine of about 18 lbs., which would further mean a decrease in lifting power of something like 150–180 lbs. This is at so low a speed as 70 m.p.h. At the speeds attained by the modern aeroplane the difference would, of course, be still more pronounced.

The last part of the report, by Professor Charles E. Lucke of the Columbia University, deals with the thermodynamic efficiency of present types of internal combustion engines for aircraft. It is printed in two parts, of which the first is headed "Review of the development of engines suitable for aeronautic service," while in the second the author analyses aero engines with reference to elements of process or function. These reports are naturally in the nature of historical reviews of what has been done up to the present, and consist partly of tables in which engines are grouped according to class, or giving weights of engines in lbs./h.p. *versus* type of construction, or weights of engine accessories and complete plant weights per h.p. *versus* type of construction. In the second section are given some interesting and useful tables of mean effective pressures referred to brake horse-power *versus* engine classes; fuel consumption and thermal efficiency *versus* engine classes; and tables of materials for engine parts. In addition the author points out the logical conclusions to be drawn from a perusal of the various tables, and gives some sound advice regarding what to aim at and what to avoid.

Altogether the American National Advisory Committee are to be congratulated on their first annual report, which contains much that is of value in spite of the adverse circumstances under which the material was gathered, and when an American institution is permanently established for research and investigation into the problems of aeronautical science, we should like to think that it will co-operate with similar institutions in Europe, so apportioning the research work that the various laboratories would supplement one another instead of overlapping, as happens not infrequently now. Such overlapping has, of course, its uses, in so far as it affords opportunities of checking independent methods and results, but many of the problems with which we are most immediately concerned might well be divided among the different institutions, thus accelerating the research and consequently the more rapid progress of a science which will before long be of such enormous importance in the intercommunication between nations, that it is to the mutual interest of all countries to bring the best engineering talent and scientific knowledge to bear on the various problems of aeronautical science. In this way much might be accomplished, and a great deal of precious time saved.



LAUNCHING A GERMAN SEAPLANE.—Before the war a good many attempts were made by German constructors at producing a combined wheel and float undercarriage so as to enable machines to start from or alight on either land or sea. In the above photograph, however, the wheels and tackle on top of the floats appear to be detachable, to be used probably for running the machine short distances over land, and left behind when she takes the water. The floats, it will be observed, are of the two-stepped type, the first two sections being flat-bottomed, while the portion behind the rear step has a Vee bottom. The flags on the lower wing tips are in all probability fitted to a cable, and movable for signalling purposes.

The British Air Service

"PER ARDUA AD ASTRA"

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, *it is not repeated in this column.*

Royal Naval Air Service.

THE following appeared among the Admiralty announcements of the 13th inst. :—

E. A. Wadsworth granted a temporary commission as Sub-Lieutenant (R.N.V.R.), seniority of June 10th.

R. D. Hallam granted a temporary commission as Sub-Lieutenant (R.N.V.R.), seniority of June 12th, and appointed to "President," additional, for R.N.A.S.

The following appeared among the Admiralty announcements of the 15th inst. :—

L. G. Steel, P. H. Ingham, and M. S. Walker all entered as Probationary Flight Sub-Lieutenants, seniority of June 18th, and appointed to "President," for R.N.A.S.

The undermentioned have been entered as Probationary Flight Sub-Lieutenants (temporary), seniority of June 18th, and appointed to "President," for R.N.A.S.: V. C. E. Marten-Gwilliam, E. P. Will, V. C. Holyman, E. McTurk, E. A. Bolton, E. B. Gammon, F. C. Walker, A. R. Jones, E. S. Arnold, S. F. Ingram, D. F. W. Baden-Powell, N. G. Hodson, E. Pierce, W. J. de Salis, T. R. Swinburne, J. S. May, A. S. Mather, D. I. Davies, G. H. Stephens, J. S. Wright, and E. W. Keesey.

Probationary Flight Sub-Lieut. (temporary) J. A. Nash granted a temporary commission as Sub-Lieutenant (R.N.V.R.), seniority of June 14th, and appointed to "President," for R.N.A.S.

A. A. N. Haywood, D. G. McGregor, A. C. Stevens, and G. N. Jackson all granted temporary commissions as Sub-Lieutenant (R.N.V.R.), seniority of June 14th, and appointed to "President," for R.N.A.S.

The following appeared among the Admiralty announcements of the 16th inst. :—

Temporary commissions as Lieutenant and Sub-Lieutenant, R.N.V.R., respectively, have been granted to S. C. H. Davis and J. M. Stuart, seniority of June 15th, and both appointed to "President," additional, for R.N.A.S.

The following appeared among the Admiralty announcements of the 19th inst. :—

Midshipman R. V. Goddard promoted to Acting Sub-Lieutenant, seniority of May 15th, and graded Flight Sub-Lieutenant.

F. V. Cowell entered as Sub-Lieutenant (temporary) (R.N.V.R.), seniority June 17th.

G. H. K. Bone, A.B., and B. Grant both granted temporary commission as Sub-Lieutenant (R.N.V.R.), seniority, respectively, June 16th and 17th.

Royal Flying Corps (Military Wing).

THE following appeared in the *London Gazette* of the 13th inst. :—

Flight-Commanders.—Capt. Lord A. R. Innes-Ker, D.S.O., R. Horse Gds., from a Flying Officer; May 25th, 1916.

Flying Officers.—May 17th, 1916: Temporary Second Lieut. T. S. Green, attached N. Staff. R., and to be transferred to the General List; Second Lieut. B. V. S. Smith, R. War. R., and to be seconded; Second Lieut. P. C. Garratt, Special Reserve; May 20th, 1916. May 22nd, 1916: Second Lieut. J. E. Catherall, R. War. R., from a Flying Officer (Observer); Second Lieut. D. W. S. Paterson, Special Reserve; Second Lieut. J. C. McMillan, R. Sc. Fus., and to be seconded; Second Lieut. L. C. Angstrom, Special Reserve.

Memoranda.—Henry E. A. Lindsay, late Capt. Reserve of Officers, to be Temporary Capt. for duty with the R.F.C.; March 18th, 1916. (Substituted for the notification in the *Gazette* of March 28th, 1916.

Supplementary to Regular Corps.—To be Second Lieutenants (on probation): Alexander N. Appleford; May 11th, 1916. Henry J. Whittingham; June 3rd, 1916.

The following appeared in a supplement to the *London Gazette* issued on the 14th inst. :—

Warrant Officer, to be Second Lieut. for Service in the Field, R. W. Surrey Regt.—Sergt.-Major W. F. Bryant, from R.F.C. and seconded for duty with the R.F.C.; May 16th, 1916.

Memoranda.—N.C.Os. and men to be Temporary Second Lieuts. on probation, for duty with the R.F.C.: Lce.-Corpl. Donald Clarke from H.A.C.; May 6th, 1916. Corpl. G. H. Wood, from Midd'x R.; May 9th, 1916. May 15th, 1916: Corpl. Derek P. Cox, from Machine Gun Corps; Pte. Lawrie W. B. Parsons, from H.A.C. May 16th, 1916: Corpl. George T. Richardson, from R.E.; Lce.-Corpl. Charles Murchie, from A.S.C.; Pte. Frederick W. Rennie, from A.S.C.

Establishments.

Flight-Commanders.—Temporary Capt. C. A. Hooper, Special Reserve, from a Flying Officer, and to retain his temporary rank whilst so employed; May 31st, 1916. Capt. G. A. Parker, North'n R., from a Flying Officer (Observer); June 2nd, 1916.

Flying Officers.—May 22nd, 1916: Lieut. R. H. Marshall, North'n R., Special Reserve, from a Flying Officer (Observer); Temporary Lieut. J. M. E. Shepherd, General List, from a Flying Officer (Observer); Temporary Second Lieut. G. A. Thompson, R. Suss. R., and to be transferred to the General List; Second Lieut. W. W. Stainer, R. Suss. R. (T.F.); Second Lieut. C. R. Steele, York R., and to be seconded. May 24th, 1916: Second Lieut. (Temporary Lieut.) O. Stewart, Midd'x R. (T.F.); Temporary Lieut. H. E. Fletcher, General List, from a Flying Officer (Observer); Temporary Second Lieut. S. G. Kingsley, York. and Lanc. R., and to be transferred to the General List. May 25th, 1916: Lieut. G. C. O. Usborne, Canadian Motor Machine Gun Service; Second Lieut. (on probation) G. H. Bonnell, R.A., Special Reserve.

Memoranda.—To be Temporary Second Lieutenants for duty with the R.F.C.; June 3rd, 1916: Sergt. Robert G. McMurray, from R. Ir. Rif.; Sergt. Frederick P. Kane, from Can. Local Forces; Sergt. Charles G. H. Wadleigh, from Can. Training Div.; Sergt. George H. Raitt, from Can. Engrs.; Sergt. Vernon B. Allen, from Can. Local Forces; Cadet-Sergt. James H. Sayer, from Whitgift Grammar School O.T.C.; Corpl. William H. Farrow, from R.E.; Corpl. Arundell G. C. Wallis Faulkner, from 61st Can. Inf. Bn.; Corpl. Horace G. W. Debenham, from Winch. Coll. O.T.C.; Corpl. Horace G. C. Bowden, R.E.; Lce.-Corpl George Edwards, from 3rd City of Lond. Yeo. (T.F.); Gnr. Ian V. Pryott, from Motor Machine Gun Corps; Dvr. Joseph S. Davis, from H.A.C. (T.F.); Pte. Henry E. K. Eccles, from Univ. of Lond. O.T.C.; Pte. Leslie E. J. Lonnen, from H.A.C. (T.F.); Pte. Charles G. Baker, from a Prov. Bn. (T.F.); Pte. John V. Aspinall, from Worc. R. (Special Reserve); Pte. Follett B. Luget, from 2nd Co. of Lond. Yeo. (T.F.); Pte. Frederick H. Reynell, from 1st City of Lond. Yeo. (T.F.); Pte. Albert W. S. Molineux, from S. Staff. R. (T.F.); Pte. C. de Frece, from 1st Co. of Lond. Yeo. (T.F.); Cadet Arthur W. Smith, from Artists' Rifles O.T.C.; Cadet Geoffrey H. Cock, from Artists' Rifles O.T.C. From Inns of Court O.T.C.: Lce.-Corpls. Sydney L. Pope and Walter Cochrane, Ptes. Charles E. Ward, Alan H. Fenton, Frank W. Michell, Alfred E. Bowen, Arthur J. Fisher, Donald Coates, Philip S. Joyce, Joseph L. Tibbetts, and Ivan E. M. Mackenzie.

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in their rank; G. L. Faulkner, L. C. Boyd, G. E. Hewson. To be Second Lieutenants (on probation): Keppel A. C. Creswell; April 3rd, 1916. June 3rd, 1916: Alexander Brown, Joseph F. MacKinnon, Harold V. Phippen, Arthur B. Vallance, William M. Kent, Lynton W. Wood, Edward E. Erlebach, Herbert E. Steinberg, Edgar M. Milling, Leslie W. White, Norman B. Hair, Arthur A. McNeil, Gerald L. Rodwell, Henry Stroud, Edward P. Lyon, Cyril L. Milburn, Sidney C. Maytom, William H. Douche, Noel E. Chandler, Vernon T. Norminton, Andrew Carruthers, Henry H. Griffith, Harold E. Startin, Arnold R. Crisp, Russell W. Cross, Philip G. Robinson, Ernest D. Abbott, Reginald A. B. Hall, William T. Hall, Ernest H. Wingfield, Donald A. Macneil, John B. Ackroyd, Walcot B. Wood, Claude L. Baldwin, Harry A. Howell, Bert James, Geoffrey F. Hughes, Arthur N. Benge, Victor H. Collins, Arnaud E. M. Jansen, Herbert W. Sellars, Joseph S. Mitchell, Geoffrey, K. Webb, Maurice Hughes, Reginald S. Larkin, William T. B. Tasker, Francis L. Luxmoore, William D. B. Taylor, William R. Bowick, George H. Jacob, Rolf M. Neill, Frederick H. Gay, Edward G. C. Quilter, Arthur G. Jarvis, Noel E. S. Simon, Clifford C. White, Gowan A. Giles.

The following appeared in a supplement to the *London Gazette* issued on the 15th inst. :—

Flying Officers.—May 23rd, 1916: Lieut. J. H. C. Minchin, Sco. Rif., from a Flying Officer (Observer). Second Lieut. J. L. P. Armstrong, A.S.C. (T.F.), from an Assistant Equipment Officer. Temporary Second Lieut. K. A. Creery, General List,

from a Flying Officer (Observer). Second Lieut. E. M. Smith, Special Reserve. May 24th, 1916: Lieut. (Temporary Capt.) R. H. D. Lee, Norf. R. (T.F.); Lieut. R. P. Harvey, Norf. R. (T.F.); Second Lieut. S. E. Pither, K. O. Sco. Bord., from a Flying Officer (Observer); Second Lieut. (on probation) R. Sherwell, Linc. R., Special Reserve, and to be seconded; Temporary Second Lieut. T. F. Bassett-Smith, General List; Second Lieut. G. H. E. Rippon, Special Reserve (since deceased); Temporary Second Lieut. A. R. Johnston, General List, from a Flying Officer (Observer); Temporary Second Lieut. J. Godlee, General List. May 27th, 1916: Lieut. E. J. D. Routh, K. R. Rif. C., Special Reserve, and to be seconded; Temporary Second Lieut. F. G. Saunders, attached 7th D. G., and to be transferred to the General List. Second Lieut. S. F. Vincent, Special Reserve; May 28th, 1916.

Memorandum.—Leading Mechanic Sydney R. Axford, from R.N.A.S., to be Temporary Second Lieutenant for duty with the R.F.C. May 22nd, 1916.

Supplementary to Regular Corps.—Second Lieut. (on probation) Patrick R. Stirling relinquishes his commission; June 3rd, 1916. Second Lieutenants (on probation) confirmed in this rank: L. J. Pearce, F. H. Hodgson, H. R. Hawkins, S. F. Vincent, G. H. E. Rippon (since deceased), and E. M. Smith. Harold B. Neame to be Second Lieutenant (on probation); June 2nd, 1916.

The following appeared in the *London Gazette* of the 16th inst.:—

Flying Officers.—May 27th, 1916: Temporary Lieut. H. A. Tweedie, General List, from a Flying Officer (Observer). Second Lieut. G. W. E. Baker, R. Berks. R., and to be seconded. Second Lieut. C. de W. Taylor, 20th Hrs. Special Reserve, from 13th Reserve R. of Cavalry. Temporary Second Lieut. H. Pearman, Leins. R., and to be transferred to the General List. Second Lieut. D. S. Johnson, Home Counties Div., Cyclist Companies, Divl. Mounted Troops (T.F.); Second Lieut. C. H. C. Woollven, Devon R., and to be seconded; Second Lieut. F. H. Hodgson, Special Reserve; Second Lieut. (on probation) J. R. Gould, Second Regt. K. E. Horse, Special Reserve, and to be seconded; May 28th, 1916. May 29th, 1916: Lieut. W. O. Ralkes, E. Kent. R., Special Reserve, from a Flying Officer (Observer). Temporary Second Lieut. F. J. Terrell, Som. L.I., and to be transferred to the General List; Second Lieut. R. S. Capon, L'pool. R. (T.F.), from an Assistant Equipment Officer: Temporary Second Lieut. A. E. S. Story, General List; Second Lieut. W. R. S. Wilberforce, K. R. Rif. C., General List; Second Lieut. H. R. Hawkins, Special Reserve; Second Lieut. (Temporary Lieut.) W. H. A. Whitworth, Dorset R. (T.F.); May 30th, 1916.

Flying Officers (Observers).—Lieut. W. R. B. Annesley, R.E. T.F.); Oct. 21st, 1915: Lieut. R. G. Macnaughton, 6th R. Highrs. (T.F.); May 26th, 1916. May 27th, 1916: Lieut. F. Billinge, Manch. R. (Special Reserve), and to be seconded. Second Lieut. (on probation) G. E. Chancellor, R. W. Surr. R. (Special Reserve), and to be seconded. Second Lieut. E. R. Davis, Worc. R., and to be seconded; May 29th, 1916. May 30th, 1916: Temporary Lieut. C. Fairbairn, General List; Temporary Lieut. R. A. Walmisley, A.S.C., and to be transferred to the General List; Lieut. G. W. Panter, R. Ir. Rif., and to be seconded; Second Lieut. C. W. Short, Ind. Army Res. of Off.; Second Lieut. A. T. Rickards, R.A., and to be seconded; Second Lieutenant (on probation) G. Leckie, R.G.A. (Special Reserve); Temporary Second Lieut. T. S. Howe, Conn. Rang., and to be transferred to the General List; Temporary Second Lieut. H. M. Parsons, General List. May 31st, 1916: Temporary Lieut. E. P. M. Robinson, N. Lan. R., and to be transferred to the General List; Lieut. R. Oxspring, Yorks. L.I. (Special Reserve), and to be seconded; Temporary Lieut. J. H. F. McEwen, Cam'n Highrs., and to be transferred to the General List; Temporary Lieut. C. R. Davidson, Arg. and Suth'd Highrs., and to be transferred to the General List; Lieut. A. C. Maund, 8th Can. Inf. Bn.; Temporary Second Lieut. G. F. Westcott, A.S.C., and to be transferred to the General List; Temporary Second Lieut. J. B. Tait, Durh. L.I., and to be transferred to the General List; Second Lieut. S. A. Villiers, R.A., and to be seconded; Second Lieut. H. S. Macneil, R.F.A. (Special Reserve); Temporary Second Lieut. L. D. Brown, Motor Machine Gun. Serv., and to be transferred to the General List; Temporary Second Lieut. M. C. Breese, N. Staff. R., and to be transferred to the General List.

Assistant Equipment Officers.—Temporary Second Lieut. T. F. G. Strubell, General List; Jan. 31st, 1916. March 29th, 1916: Temporary Capt. F. R. Williams, S. Staff. R., and to be transferred to the General List; Qrmr. and Hon. Lieut. L. Newman, City of Lond. Yeo. (T.F.); Second Lieut. J. A. O'Brien, Lond. R. (T.F.); Second Lieut. (on probation) R. L. Brancker, Special Reserve. Second Lieut. (on probation) K. A. C. Creswell, Special Reserve; April 4th, 1916. Second Lieut. C. H. Whittington, Special Reserve; April 11th, 1916. Second Lieut. (on probation) H. W. Mills, Special Reserve; April 12th, 1916. Temporary Second Lieut. J. H. Mackie, General List; May 20th, 1916. Second Lieut. L. J. Pearce, Special Reserve; May 30th, 1916. June 1st, 1916: Temporary Second Lieut. A. S. Ellerton, General List; Temporary Second Lieut. B. Cook, General List.

Staff Officer (graded for purposes of pay as a Staff Captain).—Capt. Hon. M. Baring, R.F.C. Special Reserve, from an Assistant Equipment Officer; May 19th, 1916.

Memorandum.—Lce.-Corpl. Cuthbert A. Sutcliffe, from Rossall School, O.T.C., to be temporary Second Lieut. for duty with the R.F.C.; June 3rd, 1916.

Supplementary to Regular Corps.—Second Lieutenants (on probation), confirmed in their rank: C. H. Whittington, W. E. Roe. Gilbert B. Redgrave to be Second Lieut.; June 5th, 1916. To be Second Lieuts. (on probation): Alexander J. M. Ross; May 17th, 1916. Herbert G. Gibbs; May 22nd, 1916. May 23rd, 1916: Harold B. Dresser, Thomas G. Mellanby.

The following appeared in a supplement to the *London Gazette* issued on the 18th inst.:—

Flight-Commanders, from Flying Officers, and to be Temporary Captains whilst so employed.—Lieut. S. H. B. Harris, Special Reserve; June 2nd, 1916. Temporary Second Lieut. J. Callaghan, General List; June 5th, 1916.

Flying Officers.—Second Lieut. E. A. de Pass, 3rd Co. of Lond. Yeo. (T.F.); May 27th, 1916. May 31st, 1916: Second Lieut. J. B. E. Crosbie, Worc. R., Special Reserve, and to be seconded; Second Lieut. D. S. Cairnes, Rif. Brig., and to be seconded; Temporary Second Lieut. G. B. J. Firbank, Welsh R., and to be transferred to the General List; Second Lieut. W. E. Roe, Special Reserve. June 2nd, 1916: Capt. C. R. Tidswell, 1st Dns.; Temporary Second Lieut. R. J. Sanceau, R.A., and to be transferred to the General List.

Flying Officer (Observer).—Lieut. (Temporary Capt.) E. E. N. Burney, R. Berks. R., and to be seconded; June 1st, 1916.

Balloon Officers.—Lieut. P. G. Bateman, Lond. R. (T.F.); May 21st, 1916. Second Lieut. L. F. G. Spencer, Sea. Highrs., Special Reserve; May 22nd, 1916.

Assistant Equipment Officer.—Second Lieut. R. W. B. Billinghurst, Special Reserve: June 13th, 1916.

Memoranda.—To be Temporary Second Lieuts. for duty with the R.F.C.; June 17th, 1916: Capt. John L. Trollope, from R.E.; Cpl. George F. Lines, from No. 1 Reserve, M.T. Depôt; Cpl. Cecil C. Gibbs, from 3rd City of Lond. Yeo. (T.F.); Gunner Alfred C. Day, from Suss. R.G.A. (T.F.); Sapper Edmond P. Wilmot, from Australian Engrs. From Inns of Court O.T.C.: Ptes. Fitzgerald, A. H. F. Perks-Morris, Roy W. Chappell, and Frederick M. Capiter.

Supplementary to Regular Corps.—J. H. Simpson, from Lieut., attached 5th Canadian Inf. Bn., to be Lieutenant; May 1st, 1916. Second Lieutenants (on probation), confirmed in their rank: C. St. G. Campbell, R. L. Brancker, and H. W. Mills. Raymond W. B. Billinghurst to be Second Lieut.; June 13th, 1916. To be Second Lieuts. (on probation) Harry E. L. Pilbrow; May 11th, 1916. George P. Achurch; May 22nd, 1916. Maurice Sharp; June 3rd, 1916.

The following appeared in a supplement to the *London Gazette* issued on the 19th inst.:—

Wing-Commander.—Major R. E. T. Hogg, C.I.E., 38th Horse, Ind. Army, from a Squadron-Commander, and to be Temporary Lieutenant-Colonel whilst so employed; May 30th, 1916.

Flight-Commanders (from Flying Officers, and to be Temporary Captains whilst so employed).—Second Lieut. J. R. McCrindle, Gord. Highrs. (T.F.); May 9th, 1916. Lieut. G. C. de Dombasle, R. Can. R.; May 17th, 1916.

Equipment Officers.—Temporary Lieut. (Temporary Capt.) M. D. Methven, London R. (T.F.), from a Flight-Commander; April 26th, 1916. Second Lieut. H. B. T. Childs, Special Reserve, from an Assistant Equipment Officer, and to be Temporary Captain whilst so employed; June 1st, 1916.

Flying Officer.—Lieut. A. P. Selwyn, Ind. Army Res. of Off. (since deceased); May 16th, 1916.

Assistant Equipment Officer.—Temporary Second Lieut. (on probation) S. W. Cooper, Machine Gun Corps, and to be transferred to the General List; May 30th, 1916.

Memoranda.—Temporary Second Lieutenants to be Temporary Lieutenants for duty with the R.F.C.; April 15th, 1915: D. D. Drury, C. A. Gladstone, B. P. Greenwood (now Temporary Capt.).

Second Class Air Mechanic Marmaduke L. Horn, from R.F.C., to be Temporary Second Lieut. for duty with the Military Wing of that Corps; May 27th, 1916.

To be Temporary Second Lieuts. for duty with the R.F.C.: Pte. Ralph G. Hutchinson, from 1st Glam. Yeo. (T.F.); May 18th, 1916 W. Hall, from 17th Res. Bn., Can. Exp. Force; June 17th, 1916.

Supplementary to Regular Corps.—Second Lieut. E. H. McLachlin (previously incorrectly described as G. H. McLachlin)

relinquishes his commission; March 28th, 1916. Second Lieut. (on probation) A. M. Thomas is confirmed in his rank. To be Second Lieuts. (on probation): Paul Adams; May 22nd, 1916. William V. Bevon; June 7th, 1916.

HONOURS.

Mentioned in Despatches.

INCLUDED in the lengthy list of names mentioned for gallant and distinguished conduct in the field in General Sir Douglas Haig's despatch dated April 30th, and published in a supplement to the *London Gazette* issued on June 15th, there are the following:—

Staff.

Lieut.-Col. (Temporary Brig.-Gen.) E. B. Ashmore, C.M.G., M.V.O., R.A.
Brevet Lieut.-Col. (Temporary Brig.-Gen.) L. B. Boyd-Moss, S. Staffs. Regt.
Major (Temporary Lieut.-Col.) A. H. Marindin, R. Highlanders.
Brevet Col. (Temporary Major-Gen.) H. M. Trenchard, C.B., D.S.O., A.D.C., R. Sc. F.

Royal Naval Air Service.

Flight Sub-Lieut. S. Bell; Flight-Lieut. W. H. E. Campbell; No. F. 4595 Petty Officer W. E. Byrne; No. F. 2689 Leading Mechanic C. W. Hart.

Royal Flying Corps.

Major (Temporary Brig.-Gen.) H. R. M. Brooke-Popham, D.S.O., Oxf. and Bucks L.I.; Major (Temporary Brig.-Gen.) J. M. Salmond, D.S.O., R. Lanc. R.; Major R. C. Donaldson-Hudson (T.F. Reserve); Capt. (Temporary Major) G. B. Hynes, R.A.; Major (Temporary Lieut.-Col. C. L. N. Newall, 2nd Ghurka Rif.; Capt. (Temporary Major) U. J. D. Bourke, Oxf. and Bucks L.I.; Capt. (Temporary Major) H. D. Harvey-Kelly, D.S.O., R. Ir. Reg.; Capt. (Temporary Major) W. F. MacNeece, R.W. Kent R.; Capt. M. McR. Bell-Irving, D.S.O. (Special Reserve); Capt. A. V. Bettington (Special Reserve); Lieut. (Temporary Capt. in Army) H. L. Cooper (Special Reserve); Temporary Lieut. R. Erskine, R. Sc. Fus. (Service Battalion); Capt. R. R. de C. Grubb, 3rd Hrs.; Capt. R. E. Lewis, W.I.R.; Lieut. (Temporary Capt.) A. M. Morison (Special Reserve); Lieut. (Temporary Capt.) A. H. Morton, R.F.A.; Capt. J. E. Tennant, S. Gds.; Temporary Capt. C. S. Wynne-Eyton (Special List); Lieut. (Temporary Capt.) J. A. Cunningham, R.F.A.; Lieut. (Temporary Capt.) H. A. Oxenham (Special Reserve); Lieut. A. B. Adams (Special Reserve); Second Lieut. (Temporary Lieut.) A. J. Child, Lond. R. (T.F.); Lieut. J. A. G. De Courcy, R.G.A.; Temporary Lieut. J. T. Milne, Oxf. and Bucks. L.I.; Lieut. (Temporary Capt.) K. D. P. Murray (Special Reserve); Temporary Lieut. G. H. Norman (Special Reserve); Lieut. H. B. Russell, R.F.A.; Second Lieut. (Temporary Capt.) W. T. L. Allcock (Special Reserve); Second Lieut. (Temporary Capt.) P. Babington (Hamps. R.); Second Lieut. (Temporary Capt.) N. Goldsmith, R.A.; Second Lieut. (Temporary Lieut.) M. Henderson, D.S.O., Sea. Highrs.

Temporary Second Lieut. G. G. Boyton (Special List); Second Lieut. C. Faber, (Special Reserve); Temporary Second Lieut. W. A. W., Hallam, A.S.C; Temporary Second Lieut. T. McK. Hughes, K.R. Rif. C.; Second Lieut. H. A. D. Mackay, Hamps. R.; Second Lieut. C. E. H. Medhurst, R. Innis. Fus.; Temporary Second Lieut. J. Morris (Special List); Lieut. E. P. Plenty, Manch. R.; Temporary Second Lieut. J. B. Solomon, Oxf. and Bucks. L.I.; Second Lieut. F. J. H. Thayre (Special Reserve); Second Lieut. H. R. Vagg, Som. L.I.; Qrmr. and Hon. Lieut. J. Mead; Qrmr. and Hon. Lieut. (Temporary Capt. in Army) J. Starling; No. 174 Sergt.-Major J. McCrae: No. 263 Sergt.-Major H. V. Robbins; No. 1112 Acting Sergt.-Major J. Fulton (Flight Sergeant); No. 255 Acting Sergt.-Major W. C. Hayward (Flight Sergeant; No. 1705 Flight Sergt. M. B. Fitzgerald; No. 2292 Sergt. R. G. Foster; No. 2443 Sergt. B. G. Greenup; No. 2057 Sergt. H. E. Hunt; No. 3599 Sergt. W. G. Mantell; No. 217 Flight Sergt. D. H. Newton; No. 7146 Sergt. R. S. Northcote; No. 1027 Sergt. C. Rapley; No. 184 Flight Sergt. J. Storey; No. 780 Corpl. G. W. Hepple; No. 1961 Corpl. A. Isles; No. 4310 1st Class Air Mechanic G. D. Bell; No. 1711 1st Class Air Mechanic G. Green; No. 681 1st Class Air Mechanic J. A. Lathean; No. 3799 1st Class Air Mechanic T. L. McSwiney; No. 5853 Corpl. S. Shearing.

Royal Flying Corps (Territorial Force).

THE following appeared in the *London Gazette* of the 13th inst.:

Hampshire Aircraft Parks.—Thomas G. Waterhouse to be Second Lieutenant. June 14th, 1916.

THE FLYING SERVICES FUND—ADMINISTERED BY THE ROYAL AERO CLUB.

THE Flying Services Fund has been instituted by the Royal Aero Club for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependants of those who are killed.

The Fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers, and men.

Forms of application for assistance can be obtained from the Royal Aero Club, 166, Piccadilly, London, W.

Subscriptions.	£	s.	d.
Total subscriptions received to June 13th, 1916	10,704	5	2
Staff and Workers of Gwynnes, Ltd. (Seventeenth contribution)	8	5	3
Collected at the Westland Aircraft Works, Yeovil (Thirty-sixth contribution)	0	17	9
Miss Eleanor Bairdsmith	1	1	0
Collected by Mrs. Anderson	23	12	6
Total, June 20th, 1916	10,738	1	8

166, Piccadilly, W. B. STEVENSON, Assistant Secretary

Roll of Honour.

The following casualties have been officially announced by the War Office:—

Killed.

Second Lieutenant R. A. Stubbs, R. Munster Fus. and R.F.C.
Second Lieutenant A. C. Thouless, Norfolk Regt. and R.F.C.

Previously reported Missing, now reported Killed.

Second Lieutenant C. Gallie, R. Scots Fus., attached R.F.C.

Wounded.

Captain A. C. Clarke, Duke of Cornwall's L.I. and R.F.C.
Lieutenant W. Russell, R.E., attached R.F.C.
Second Lieutenant R. V. Walker, Connaught Rangers, attached R.F.C.
23322 2nd Class Air-Mechanic C. R. Nicholson, Royal Flying Corps.
23400 2nd Class Air-Mechanic S. J. White, Royal Flying Corps.

Previously reported Missing, now reported Wounded and Prisoner of War.

Second Lieutenant A. R. L. Goodson, London Regt. and R.F.C.

Previously reported Missing, now reported Prisoner of War.

2104 Sergeant E. Jones, Royal Flying Corps.

Aircraft Work in East Africa.

IN the despatch from Lieut.-General the Hon. J. C. Smuts, Commander-in-Chief of the East African Force, issued on Tuesday, in the form of a supplement to the *London Gazette*, describing the operations from the date of his arrival in British East Africa on February 19th last, down to March 21st, there are the following references to air work:—

"On the night of the 17th–18th Belfield's Scouts were sent from Himo Bridge to occupy Unterer Himo, and at dawn were driven off by a superior force of the enemy. A position on the Ruwu River appeared to me from patrols, intelligence reports, and somewhat incomplete air reconnaissance, to be the next which the enemy might hold, and it was of vital importance for purposes of railway extension and future advance that the enemy should be driven south of this river before the rains commenced. . . .

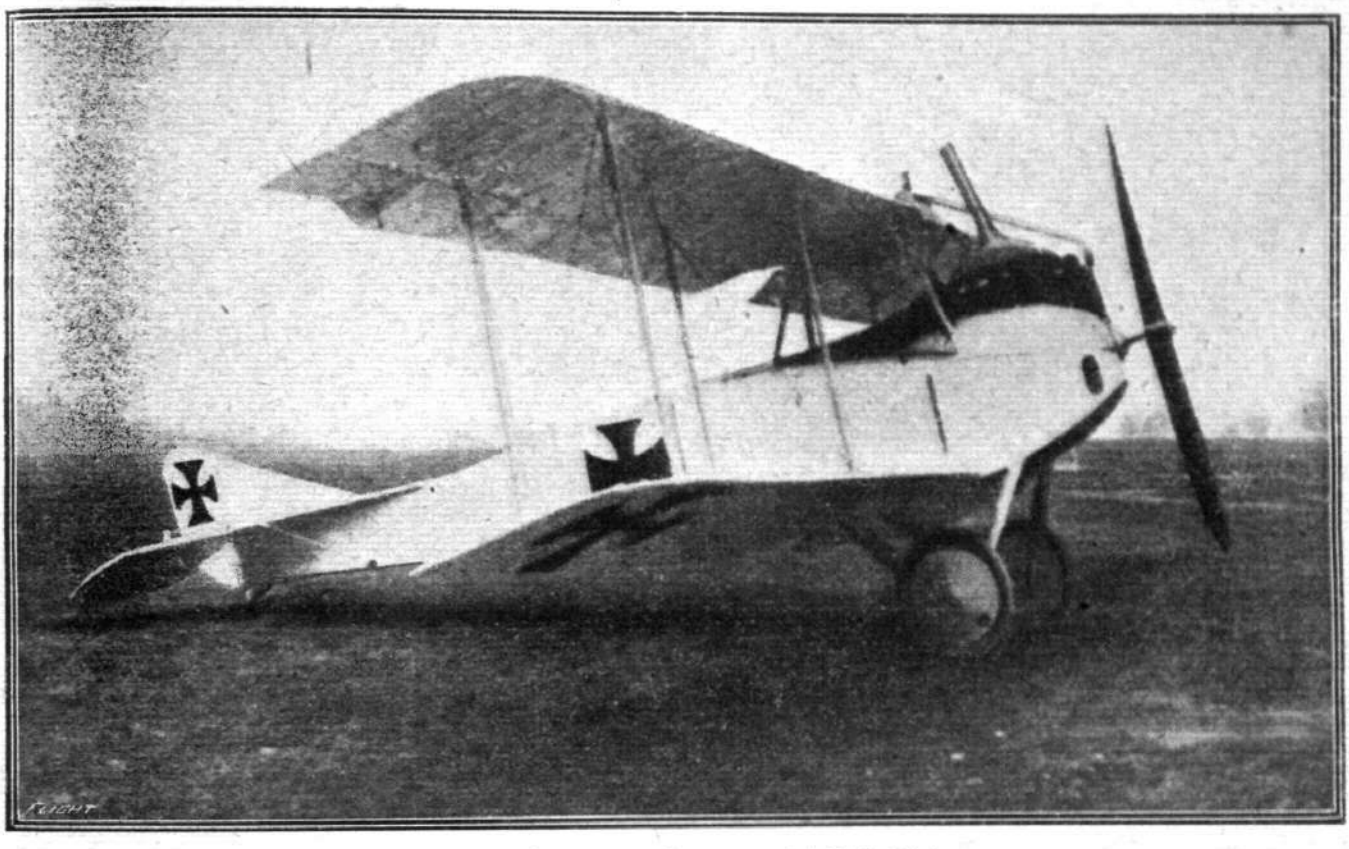
"The air services performed valuable reconnaissance work throughout the operations, and on several occasions considerably demoralised the enemy by the use of bombs."

FLIGHT

THE L.V.G. FIGHTING BIPLANE.

TYPE D.9.

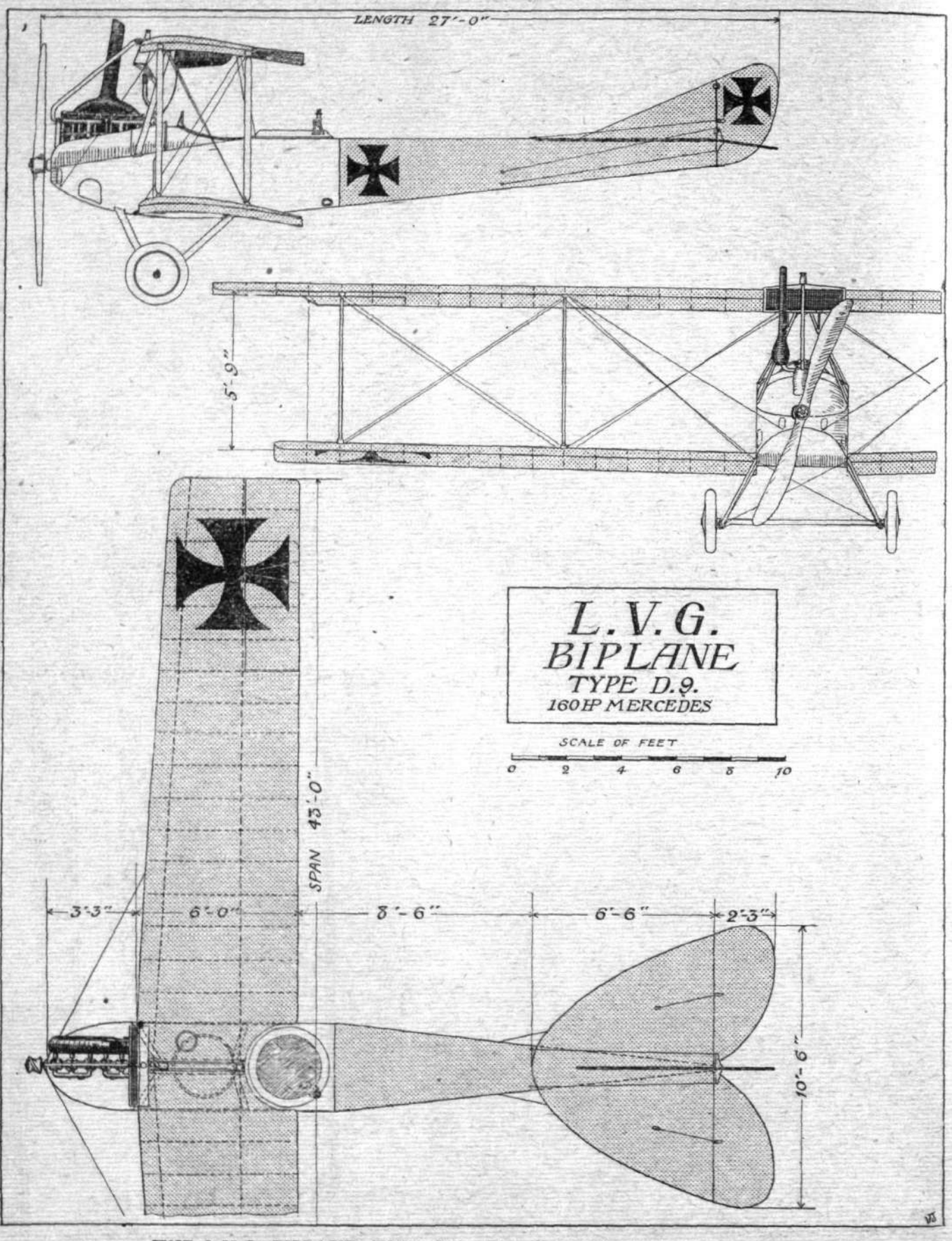
GENERALLY speaking, the various makes of German aeroplanes did not present, before the war, any great divergency, all being, practically without exception, of the tractor biplane type. Such differences as did exist were, speaking aerodynamically, divisible into three main types—those which had the wings sloping back as seen in plan, those with straight wings, and those in which the leading edge sloped back while the trailing edge was straight. The first-mentioned type could be subdivided according to the amount of backward slope, the machines built by the Deutsche Flugzeug Werke of Leipzig representing the maximum and the Aviatik biplanes the minimum slope. The best-known representative of the straight-winged type is perhaps the Albatros biplanes, while the third type, which forms, so to speak, a compromise between the other two, is confined solely to the biplanes constructed by the Luft-Verkehrs-Gesellschaft of Berlin. Since the outbreak of war the tendency has been towards even greater uniformity, the type with the sloping-back wings, or, to give its German denomination, Pfeil flieger, having,



Three-quarter front view of a captured L.V.G. biplane.

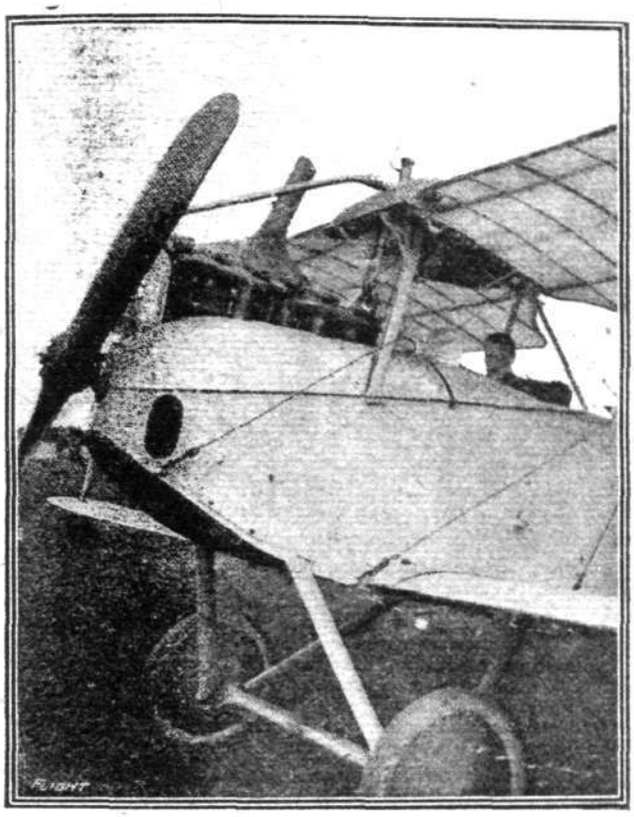
Three-quarter rear view of an L.V.G. biplane, type D.9.

as far as we are able to ascertain, practically disappeared from the western sky. The only survival is the L.V.G. type, which has retained the backward slope of its leading edge. We do not mean to infer that those firms who were producing machines of the arrow type are no longer building, but that they have—whether from choice or necessity we are not in a position to say—discarded the arrow-shaped wings for the more orthodox straight ones.



THE L.V.G. BIPLANE, TYPE D.9.—Plan, front and side elevation to scale.

At least one of the representatives of the arrow biplanes has been described in our columns, *i.e.*, the D.F.W., which was being constructed in this country before the war broke out. Last year we also gave fully illustrated

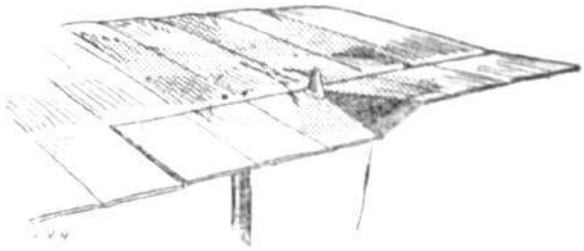


CHASSIS AND ENGINE OF AN L.V.G. BIPLANE.—Note how the radiator is built into the top plane.

descriptions of two of the captured Albatros biplanes, thus bringing our readers' acquaintance with the straight-winged German type up to date. This week we supplement these with a description of the third remaining type—the L.V.G. biplane.

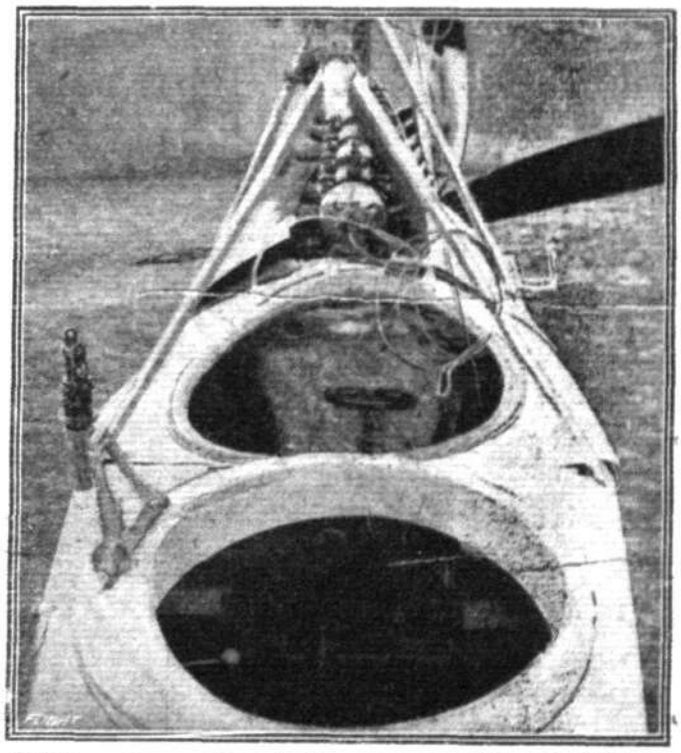
One of the most successful German machines in the races of 1914 was the L.V.G. biplane designed by Mr. Schneider, who is, we believe, a Swiss by birth. It was a machine of this type which won the Prince Henry Race and the Ostmarken Race, and from what we can learn the L.V.G. biplanes have been no less successful as fighting machines than they were in the more peaceful contests before the outbreak of hostilities.

Apart from the backward slope of the leading edge of its main planes, the L.V.G. does not differ very greatly from the Albatros biplanes, at any rate as far as outward appearances are concerned. The same rectangular section *fuselage* which characterises the Albatros is found in the L.V.G., carrying at the rear a flat stabilising plane of generous proportions, and in front a large water-cooled Mercedes engine. Constructionally, however, the L.V.G. does not follow the lines of the Albatros, especially as regards the construction of the body. In the Albatros biplanes, it will be remembered, the body is built up of six rails, one in each corner of the rectangular body and one half-way up each side. The L.V.G. approaches more to the practice followed in this country and in France, having only four longitudinal rails connected in the usual way by struts, and being braced by diagonal wiring. In our description of the Albatros biplanes we ventured to offer the opinion that the Albatros way of constructing a body had several points to recommend it from a military point of view, and there is, therefore, no need to enlarge on the subject here. There are, however, points in the construction of the L.V.G. body, which might be of some use to British constructors, and which will therefore be described in detail. In the girder type of body one of the first considerations is the choice of a suitable method of anchoring the diagonal bracing wires. In the majority of machines built in this country the fittings employed for this purpose are of two types—either a steel clip bent so as to surround the body rails and provided with lips for the various wires, or a simple socket into which the strut fits, and which is secured to the rail by one or more bolts.



Diagrammatic sketch of the peculiar stepped *ailerons* of the L.V.G. biplanes.

Both forms have their advantages and drawbacks. The clip form of fastening has the advantage that it does away with the necessity of piercing the rail, but, on the other hand, from the pilot's seat back to the stern of the body each fitting is different from the one adjoining it on each side on account of the taper which it is usual to give the rail in order to proportion it at any point to the work it has to do. This means extra expense and trouble in the



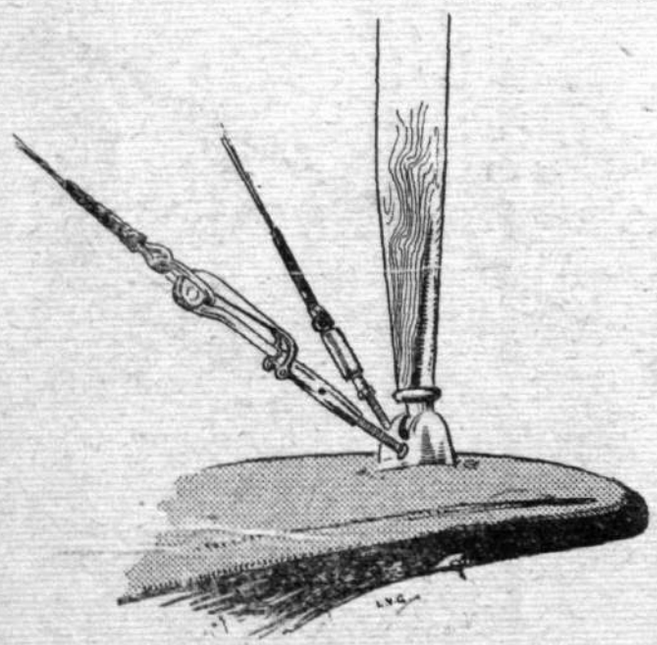
Pilot's and gunner's cockpits on a captured L.V.G. biplane.

manufacture and erecting, and although attempts have been made to overcome this obstacle by keeping the rails the same thickness from front to back, this only lessens the trouble, but does not overcome it entirely,

since it entails spindling the rail towards the tail. The other form to which reference was made is not affected by the taper of the rails, but it suffers from the very serious disadvantage that the rails have to be pierced repeatedly, a practice which we should never recommend, although we are well aware that it is employed in a number of types of official design.

The fitting employed in the L.V.G. biplane has, it appears to us, an advantage over most of the clips or sockets that have come to our notice, in so far as it would seem to possess the good points of both forms without the disadvantages of either. The struts and cross members of the body are slotted at their ends to receive the flanges of the fitting. The latter consists of a Duralumin casting of the shape shown in the sketch. Anchorage for the five wires occurring at each joint is provided by holes in the casting, which is prevented from sliding along the rail by short small wood screws. It might be objected that piercing is not absolutely avoided, but it appears to us that although this is perfectly true the weakening of the rail due to the employment of two small wood screws for each fitting is in no way comparable in magnitude with that produced by one or more bolts that have to be of sufficient diameter to serve as an anchorage for the bracing wires. Owing to the shape of the L.V.G. fitting, it will be seen that a taper in the rail does not necessitate any variation in consecutive fittings since, if all are made of the same width as the rail at its thinnest end, the only difference will be that towards the front the struts will not have their axes in line with that of the rails.

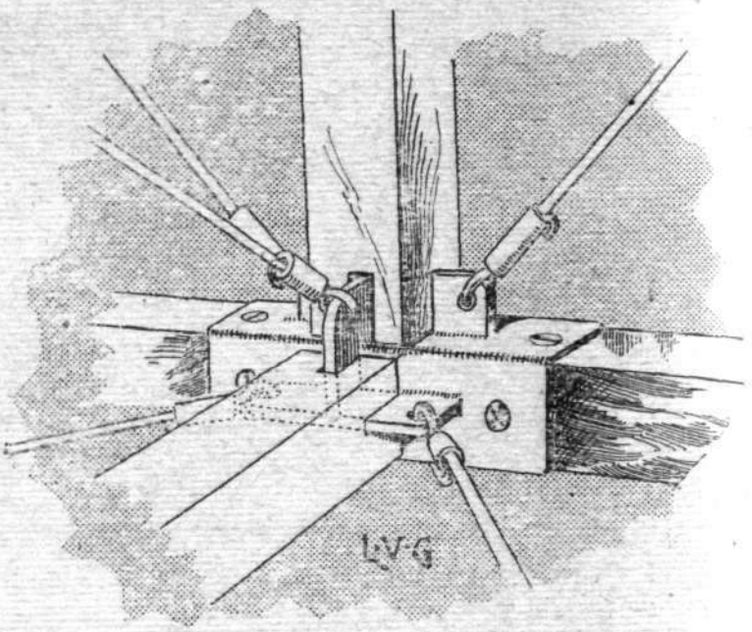
A peculiarity in the design of the L.V.G. body is that from a point between the two cockpits to the nose the upper rails slope down in a straight line (as seen from the side; in plan they curve in the usual way). The reason for this feature of the machine, a feature that it has



Inter-plane strut socket and quick-release device on the L.V.G. biplane.

possessed for a number of years, is difficult to explain, unless one takes it for granted that the idea is to provide more clearance around the lower portion of the engine. The aluminium covering over the top of the body is detachable so as to facilitate access to the interior of the body in the vicinity of the engine.

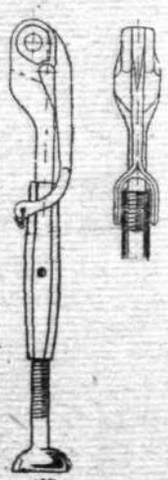
In the earlier machines of this make all the occupants were accommodated in a common cockpit, but in the latest models, of which the machine illustrated this week is an example, two distinct cockpits are provided, the



Sketch showing attachment of struts to body rails in the L.V.G. biplanes.

front one of which is occupied by the pilot, while a gunner is installed in the rear. From this position he commands a fairly free view to rearward and upward, while for firing rearwards and downwards openings are cut in the top and bottom of the body through which the machine gun may be fired. This disposition of the artillery would seem to indicate that the machine is intended for defensive rather than for offensive purposes.

The pilot, who is seated in the front seat, controls the machine by means of a foot bar and a lever terminating in a grip or handle, very similar to that of the Morane-Saulnier monoplanes. In front of him are a number of instruments almost identical with those illustrated in our description of the Albatros biplane. The engine, a 160 h.p. Mercedes, is mounted in the nose of the machine and is partly enclosed by the aluminium top cover of the body. The arrangement of the exhaust pipes is of a very simple form, consisting, as will be seen, of a short branch pipe from each cylinder running to a vertical collector pipe projecting upwards above the level of the upper plane. An unusual mounting of the radiator is employed, as will be seen from our illustrations. The radiator, instead of being mounted on the sides of the body as in earlier machines, is built into the top plane, tubes running from it down to the front and back of the engine. Whether this method of mounting is desirable for a military machine appears to us questionable. The pilot, being placed below and slightly to the rear of it, could hardly avoid being scalded should the radiator be damaged by projectiles.



The quick release device employed in the wing bracing of an L.V.G. biplane.

The main planes, which have, as we have pointed out,

their leading edge sloping back towards the tip, do not present anything out of the ordinary, either constructionally or in the section employed. The lower one is attached to the sides of the body by a quickly detachable device, while the two halves of the top plane are bolted to a steel tube *cabane* composed of four streamline steel tube struts resting with their lower ends on the top rails of the body.

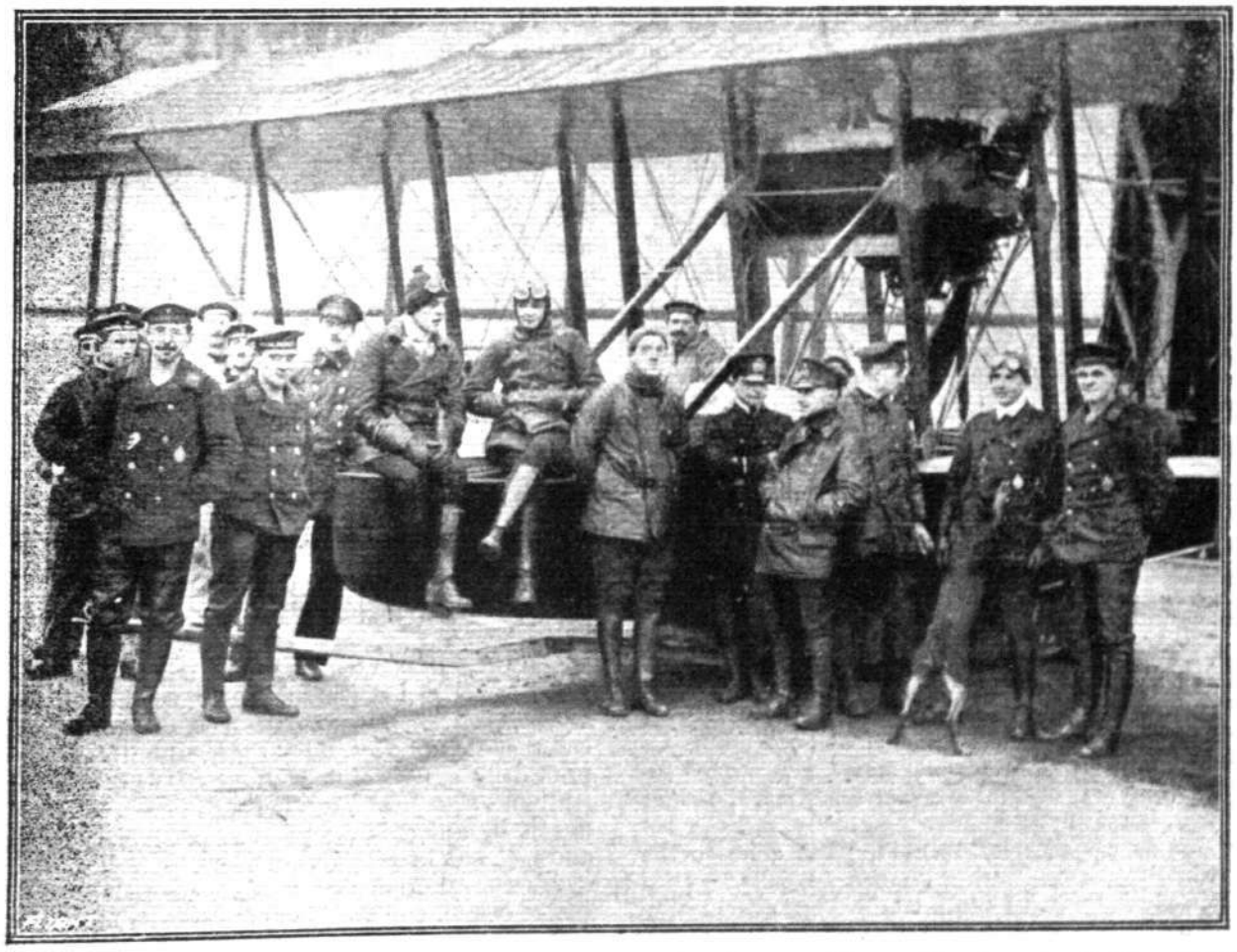
The inter-plane struts are steel tubes of streamline section tapered at both ends to take a vertical bolt which passes through the main spar. The anchorage for the bracing cables is very similar to that employed on the Albatros machines, and consists of a hollow, cup-shaped steel shell slotted in places to accommodate the strainers of the cables. A quick-release device is employed, which allows of rapid dismantling and erecting without interfering with the adjustment of the wings. The inter-plane struts are so pivoted on the eye-bolt passing through the spar that when the cables are slackened off they can pivot sideways, and the upper and lower planes be brought to lie flat one on top of the other. The general arrangement as well as a detail drawing of the quick-release device are illustrated in two of the accompanying sketches, which are, we think, self-explanatory.

In the photographs of the machine it will be noticed that the *ailerons* appear to be of a very peculiar shape, the impression being that they have a narrower chord at the tip than at the root. This is not the case, however, the break being due to the fact that the outer half of the *aileron* is set at a slight negative angle.

In the earlier models the *ailerons* were similar, in that they consisted of two portions, of which the inner was in line with the trailing edge of the fixed portion of the wing, while the outer was set at a negative angle. In the new type, however, the gap between the two halves has been covered with fabric in order, presumably, to reduce end losses and thus render the *aileron* more effective.

The tail planes follow fairly closely along the lines of other German machines, the fixed tail plane being of large area and the rudder hinged to the rear of a fixed vertical fin. A refinement is noticeable in the arrangement of the tail skid, which has in the type D.9 the rubber shock absorber placed inside the body to save resistance.

The undercarriage is almost identical with that of the Albatros biplanes. In older models, it may be remembered, a third wheel was fitted on the lower ends of two struts sloping down from the front part of the body and braced by tubes running backwards and outwards to the apices of the Vees formed by the main chassis struts. This extra wheel has been omitted in the later model, having, in fact, always been detachable and chiefly used for school work in order to protect the propeller and prevent the machine from turning over on its nose in case of a bad landing.



A German flying boat, type F.F.21, and some naval pilots and mechanics.—The machine is curiously like the big Sopwith bat boat exhibited at the last Olympia Aero Show, even to the engine, which appears to be similar to the Salmson. The similarity is so striking as to admit of only two explanations: either the machine is a captured Sopwith or a copy of the Sopwith built by the Flugzeugbau, Friedrichshafen.

SPENDING the week-end at a friend's house in the vicinity of a large aerodrome, I have been able to witness any amount of flying from the luxurious depths of an armchair by the drawing-room window, and to talk and reflect on matters of aviation, a subject as enjoyable to my friend as to myself:—really armchair reflections.

Picture me then, if you can, in surroundings in every way fitting the occupation of a Dreamer. Capacious armchair, comfortable and soft, large and low; cigar fit for the gods, and coffee like nothing on earth except coffee; replica of myself in the chair opposite, only the two of us, and both ready and eager to talk shop all the time. Out of doors, away up in a blue, almost cloudless sky, machines appearing every few minutes, and the gentler side of the household, sweet disturbers of man's after-lunch repose, somewhere up in the regions above, no doubt also thoroughly in full enjoyment, discussing the things to them that matter—frocks and their appurtenances.

Early in the afternoon a strange thing happened. I was idly watching a two-seater sailing merrily along, when suddenly she reared up in front as though about to loop, but the evolution was much more sudden than usual, so sudden, in fact, that it appeared as though she had been struck by a shell right under the nose.

Immediately she dropped over on to her right wing, offering to my astonished gaze a plan view of herself from above. And then, horror, the left wing broke off close to the body, and flew some feet in the air, and above the machine. When, also, the body broke off close behind the pilot's seat, I knew I was witnessing a most terrible accident, and an exclamation of dismay escaped me.

Yet even as I gasped, the several parts came together again as the head and limbs of a marionette in a side-show, and there was the machine travelling serenely on its former course.

It had all happened in a few seconds, yet such was the shock that I found myself taking my breath in short gasps as I soundly rated my friend for having such abominable glass in his windows.

I must explain to you that my friend is a pessimist of the very first order. I should imagine the optician's diopter would register his number at minus 9·5, or thereabouts, yet he will not wear glasses, even of a rosy colour, much as I try to persuade him. For myself, I am most optimistic, as you will no doubt have gathered from these reflections. The consequence is that between us we strike a happy medium. Sometimes I manage to convert him to my way of thinking, sometimes it is the other way about, but always it is interesting.

"Flying as a spectacle," he said, "has gone to the deuce!"

"Oh, I don't know," I ventured.

"I know that," he replied (we are nothing if not open), "but I went to Hendon yesterday and got bored stiff."

"I haven't been myself for some weeks now," I replied, "but surely there's plenty of flying going on; plenty to see; plenty to enable one to pass the time away. Of course with so many pilots away just now one cannot expect an immediate return to the old days."

"Might put up some sort of a show," he grumbled, "not much fun in watching one 'bus stunt around with passengers."

"Have new glass put in your windows," I ventured, "and look again later. Perhaps—who knows?"

* * *

"Pretty rotten," he said, "the way those German Fokkers make tracks round our machines."

"Made," I corrected. "Past tense."

"Make," he persisted. "Boelke has brought down eighteen."

"Boelke has finished."

"There's Immelmann."

"His turn's coming."

"We've got no machine that can touch them."

A long drawn out note sounded overhead. It sounded like nothing so much as a boy experimenting with a Jew's harp, playing ooorrrooorrr.

"Helloa! What's that?" he cried.

"New glass for your window."

* * *

"Hot stuff," he exclaimed later, "hundred and thirty if it's a mile."

I began to have hopes of him. We watched it playing round a "Shorthorn." It was over and under and all round about. It sprang away to the right, and came back. It sprang away to the left, and came back. It turned tail to tail and flew in an opposite direction, and came back and past and head on again for all the world like a dog worrying a rag doll. The "Shorthorn" was like nothing so much as a wounded rat trying to regain its hole, with a playful terrier continually heading it off. Had it been an air-battle in real earnest, the result would have been a foregone conclusion.

"What is it?" he asked.

"That, my friend, is our latest 'optimiser.'"

"Don't be absurd. Do you know the name of it?"

"Oh, yes. But I musn't tell—Censor, you know."

"Well, you may tell me, surely. I'll keep mum."

"Then I'll whisper it quietly. It's proper name is, I believe, British Rolled Plate Glass, warranted without bubbles."

* * *

My friend is, I am afraid, like many in this country, inclined to look only upon the dark side of things. Because we do not decorate our men with iron crosses, and print daily reports of their successes, with a grand total, he thinks all is not well. He is pandered to, I am sorry to say, by writers in the press as pessimistic as himself, and with less knowledge.

It's all a question of point of view, eyes backed by good bodily health, and the kind of glass one looks through.

My friend has his windows glazed with horribly bad glass, but his chairs are comfortable, and his wife personally attends to the making of the coffee. I am very fond of coffee, so we are not likely to fall out. But I do wish he would have those windows re-glazed.

FROM THE BRITISH FLYING GROUNDS

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Straights with instructor last week: Messrs. Dannel, Jamie, Fisher, Key, Reymer, Forster, Mills, Mulville, Rodochanochi, Rabourdine, and Welinkar.

Instructors: Messrs. Biard, Hale, Pashley, Manton, Russell, and Winter.

Brevet during week: Mr. De Beer.

Beatty School.—The following pupils were out during last week: Messrs. Roberts, Knox, Phillips, Murdoch, Garlick, Edwards, McPherson, Whitmore, Mitchell, Towson, Elliott, and Austen.

The instructors were Messrs. G. W. Beatty, G. Virgilio, A. E. Mitchell and H. Fawcett, the machines in use being Beatty-Wright dual-control and single-seater propeller biplanes and Caudron dual-control and single-seater tractor biplanes.

Certificates were taken by Messrs. A. B. Drewery, A. E. Mitchell and R. W. Stanley.

London and Provincial Aviation Co.—Pupils rolling last week: Messrs. Mander, Egerton, Daly, and Sivewright. Doing straights: Messrs. Evernden and Jones. Circuits and eights: Messrs. Dawson, Whittingham, Birkbeck, and Lieut. Deacon.

Instructors: Messrs. W. T. Warren, M. G. Smiles, L. H. Brake, and W. T. Warren, jun.

Messrs. Dawson and Whittingham are both ready to take their certificate tests.

Ruffy-Baumann School.—Pupils with instructor last week: Messrs. Trubridge, Di Balmi, Williams, Babington Smith, Beebee, Fanshawe, Wilson, Carr and Fraser. Straights or rolling alone: Messrs. Fanshawe, Westlake, Di Balmi, Fraser and Williams. Eights or circuits alone: Messrs. Westlake, Fraser and Winter.

Instructors: Edouard Baumann, Felix Ruffy, Ami Baumann, Andre Thomsen and Clarence Winchester.

Machines in use: 50 and 60 h.p. Ruffy-Baumann tractor biplanes.

By an oversight it was mentioned last week that Mr. H. E. Winter secured his certificate, whereas it should have been said that this pupil accomplished half his tests.

Bournemouth School.

PUPILS rolling alone last week: Messrs. Pritt, Scaramanga, Daniel, Green, Brandon, Turner, Hammersley, Little, Hinchliff, Wingfield, J. B. Smith, Ross and Montgomery. Straights alone: Messrs. O. Wilson, H. Smith, Barlow, Daniel and Scaramanga. Half-circuits alone: Mr. J. Wilson. Eights or circuits alone: Mr. Morris.

Instructors: Messrs. S. Summerfield and Bryneldsen; 35, 45, and 60 h.p. Caudrons in use.

Quite a lot of people visited the aerodrome on Whit-Monday and witnessed several ascents by Mr. S. Summerfield on a 60 h.p. Caudron in a very boisterous wind. The usual exhibitions were again carried out on Wednesday and Saturday afternoons before fair sized crowd, and quite a busy time was experienced with passenger flights. Mr. Etches, the general manager, had a delightful flight with Mr. Summerfield, who attained a height of over 4,000 ft., landing *en vol plané*. Several service machines again visited the aerodrome.

Some more pilots who have recently secured their Royal Aero Club certificates at the Hall Flying School, Hendon.—(1) Mr. R. Rochford, (2) Mr. S. D. Taylor, (3) Mr. E. R. Pennell, (4) Mr. C. L. Milburn, and (5) Mr. S. H. Collins.

AN INTERESTING DESIGN FOR A ROTARY ENGINE.

IN spite of the popularity of the rotary engine, or perhaps on account of it, this type has been subjected to severe criticisms, some of which would seem to be justified, while others—purely theoretical objections—have proved of small moment in actual practice. It has often been urged, for instance, that the lubrication problem is a serious one, and that a prodigal supply of oil has to make up for a defective system of distributing it. Although this was true of some of the original rotary engines, several of the latest examples of motors of this type are very reasonable as regards oil consumption. One drawback inherent to the rotary engine is the resistance to rapid rotation of the cylinders, which absorbs something like 10 to 12 per cent. of the power. Finally, and this is to our way of thinking the most serious objection in view of the fact that the tendency seems to to be towards greater power, it is generally conceded that the limiting size, if overheating is to be avoided, is about 5-in. bore, and that, therefore, increase in power can only be obtained by increasing the number of cylinders, with a corresponding increase in the number of parts liable to "go wrong." It is, however, quite possible that when the subject is further investigated it will be found that by increasing the area of the fins, making them of copper, aluminium, or some other metal that is a good conductor of heat, and by making the cylinders of such form as to offer less resistance, a very considerable increase, not only in the power developed by an engine of the dimensions used at present, but in the limiting size of an air-cooled cylinder, may be obtained.

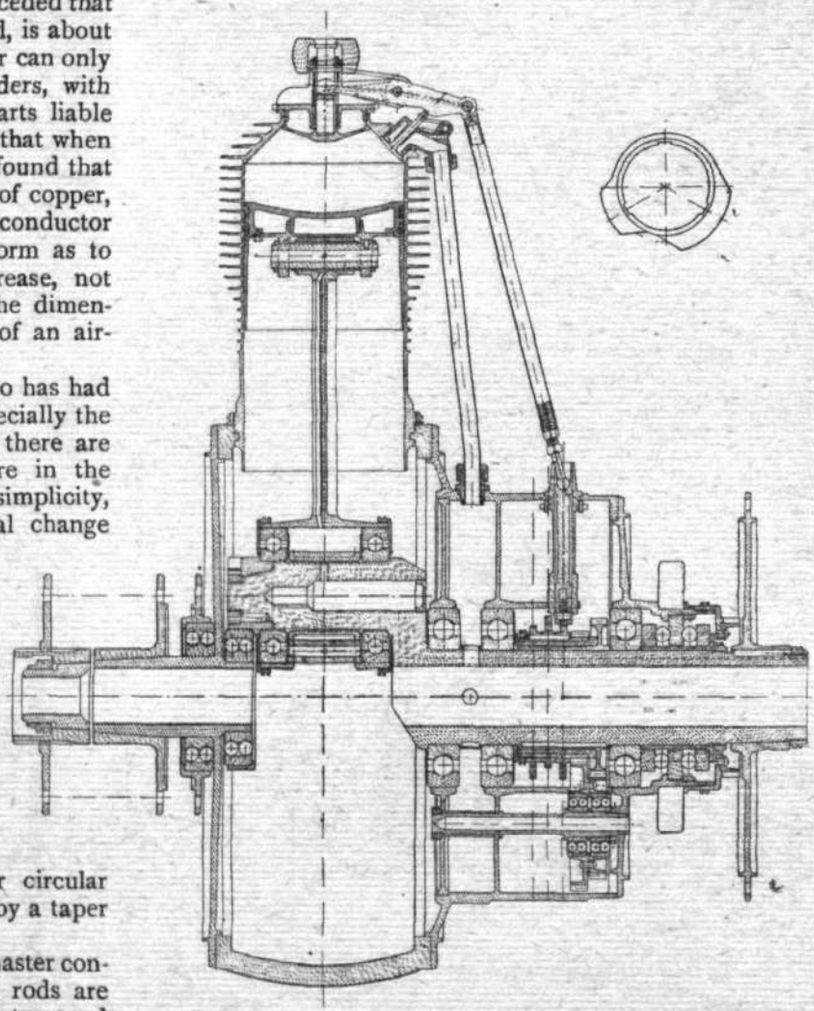
In the design patented by Mr. Umpleby, who has had a great amount of experience with radial—especially the Isaacson—as well as rotary types of engines, there are several departures, which are, however, more in the nature of attempts at greater mechanical simplicity, accessibility and reliability than in any radical change from orthodox practice.

An examination of the accompanying sectional side view of the Umpleby engine will give a good idea of the general arrangement. The engine is mounted between double bearers, of which the main bearer is situated at the rear, or induction, end of the crank shaft, while the other is placed in front of the engine, between the propeller boss and the front crank case cover. Ball bearings, it will be seen, support both front and back of the engine, and the reaction torque is taken by the rear circular engine plate, which is fixed to the crank shaft by a taper and key and locked by a nut.

As in most other rotary engines, there is a master connecting rod, to which the other connecting rods are attached by link pins, a ball bearing being interposed between the crank pin and the big-end of the connecting rod. Two end caps prevent the ball-bearing and link pins from shifting lengthwise. The construction of the piston is such that no oil can get up into the piston head, where it might become carbonised, and cause the piston to overheat. The gudgeon pin, it will be seen, is not secured to the main body of the piston, but to a false head screwed to a threaded flange projecting down from the centre of the piston head proper.

The lubrication of the engine has been very carefully thought out, so that the parts requiring oil are well supplied, while at the same time no wastage of lubricant takes place. The oil is pumped along a passage in the crank shaft to the centre of the crank pin through a hole to the chamber formed between the master connecting rod and the end caps. From here it flows, owing to centrifugal force, along the link pins, through holes from a passage around the link pin bush and up along the oil passage in the connecting rod to a passage communicating with the gudgeon pin by means of a hole. From here it is thrown by centrifugal force on to the centre portion of the piston, working out through a hole to an oil groove running around the piston.

A feature well worth noting in this design is the method whereby single cylinders can be dismantled without interfering with the other cylinders or with any of the timing gear. The rib in the crankcase ring and the rib in the cylinder are cut through like the breech of a gun, and the cylinder is inserted and given a slight twist. A small key is then fitted, and the large nut surrounding the base of the cylinder is forced tight against the crank case, thus locking the cylinder and preventing it from turning. The engine is easily dismantled for cleaning or minor repairs, this operation being in fact possible without removing the engine from the machine.



Sectional view of Mr. Umpleby's rotary engine.

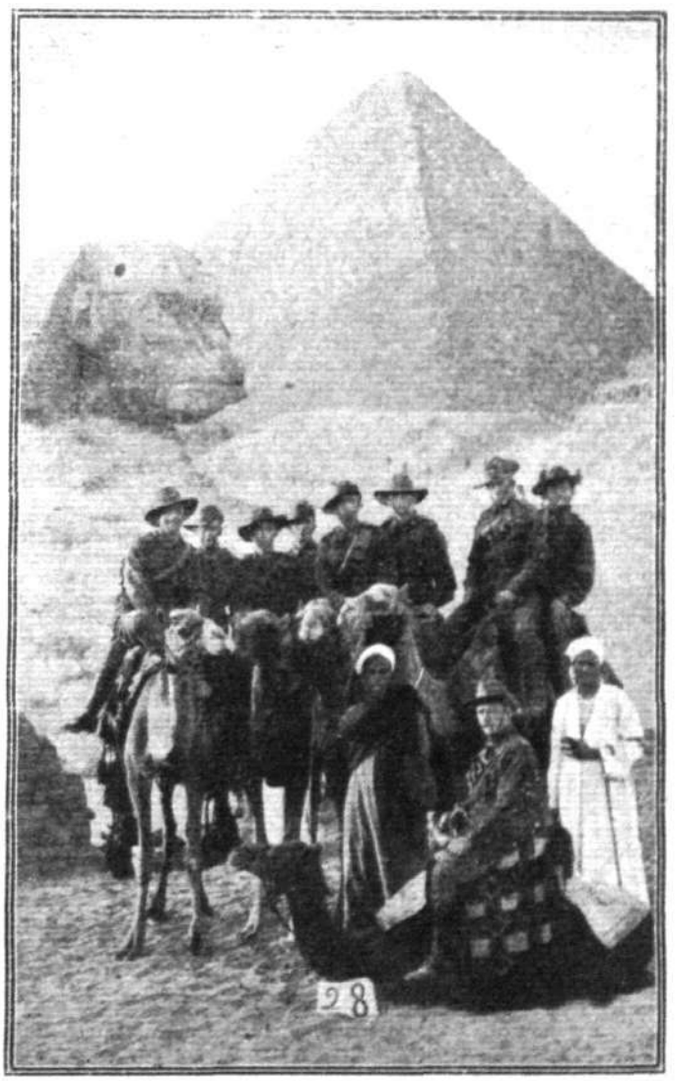
As regards the operation of the engine, this will be fairly clear from the drawing. The mixture, it will be seen, is not contained in the crank case proper, but in a chamber on the back of the crank case. From here

external induction pipes run to the small inlet valve in the top of the cylinder. The mixture is drawn from the carburettor through the hollow crank shaft to the chamber containing the rich mixture. When the piston moves inward a vacuum is caused, and the inlet valve opens against the action of a spring, and admits a rich mixture. The inlet valve remains open during the first 25 per cent. of the suction stroke, and when it closes the big valve in the cylinder head opens and admits pure air, which, on mixing with the rich charge, produces a dense explosive mixture.

When, or just after, the piston has reached the bottom of its stroke, the big valve is closed, and the piston in ascending compresses the charge, which is ignited in the usual way. Near the end of the power stroke the big valve opens again, and the exhaust gases are expelled on the upward stroke.

Inset are shown the cams operating the valves, which are driven by gears making three revolutions while the engine makes two. When the engine revolves the exhaust opening cam lifts the tappet rod, thus moving the inner end of the rocker downwards and opening the big valve. When the exhaust opening cam runs from under the roller, the tappet rod is pulled downwards by a spring, assisted by the centrifugal force acting on the balance weight on the big valve. As the cylinders and cam revolve at their respective speeds the roller falls into the hollow rich-mixture cam, and the outer end of the rocker moves downwards opening the small inlet valve, which admits the rich mixture. As the relative rotation of the cam and cylinders continues the inlet valve is held open for about 25 per cent. of the suction stroke, and the valve operating mechanism is again lifted by the pure air cam; the inlet valve is closed by its spring, and the big valve opened to admit pure air for the remainder of the suction stroke. The exhaust valve is then closed, the mixture compressed and ignited, and the sequence is repeated.

It is evident from an examination of the drawings that this engine has been designed by a practical man, and that attention has been paid to such things as accessibility and simplicity, things which practical experience has shown to be important factors in the later life and upkeep of an engine. We understand that Mr. Umpleby is endeavouring to find the necessary capital for building these engines commercially, and we shall be pleased to place anyone interested in communication with the designer.



A greeting for the New Year just to hand (the vagaries of the Postal service are unfathomable) from Driver V. P. Taylor (Royal Aero Club pilot, No. 376), who has joined up with the 2nd D.A.C., A.I.F. Driver Taylor is seated on the camel in the foreground, with the Pyramids and the Sphinx in the background, the rest of his comrades being also members of the 2nd D.A.C.

CORRESPONDENCE.

High-Speed Bearings and Lubrication.

[1925] I have been sometime partly engaged in evolving an aero engine, and I seek information of your readers.

Years back I had a notion that piston speed was limited because the lubrication might fail at the higher speeds, but in automobile practice it has been proved up to the hilt entirely satisfactory to more than double the piston speeds considered high fifteen to twenty years ago.

Piston speeds seem only to be limited by the inertia and centrifugal forces, provided the speed of the gases in and about the valves is moderate.

The more immediate enquiry of this letter is as to whether there is a limit to the journal surface speed of the bearings. If this speed can be considerable then the diameters of the pins and main bearings can be increased, giving not only a stiffer crank shaft, but less pressure per square inch.

Obviously, the friction would be greater, but this is a small matter relatively.

A. E. PARNACOTT.

Penge, June 16th.

FLYING AT HENDON.

THE high winds with which we have been favoured of late still prevailed on Saturday and Sunday last, so the flying at Hendon was, therefore, somewhat restricted. On Saturday one of the 80 h.p. G.-W. three-seater biplanes took up a number of passengers, piloted in turn by B. F. Hale, Marcus D. Manton, M. Osipenko, and C. Pashley, until a leak in the oil tank put a stop to the good work. Geo. Beatty came out for an airing on the 50 h.p. (Anzani) Beatty-Caudron and put up a few stunts. Several other flights of an unofficial character were made during the afternoon by sundry de Havilland pusher scouts, B.E.'s, Curtiss tractors and the Sopwith "Skyscraper," the latter machine creating much interest by its remarkable performance. Later in the evening some of the more advanced pupils got in a little practice.

On Sunday a little more flying was got through, the 80 h.p. G.-W. being once more in commission as well as one of the 60 h.p. school 'buses, the pilots being the full G.-W. stud. W. T. Warren, jun., and Geo. W. Beatty were out on L. and P. and Beatty-Caudrons respectively, and someone put up a fine looping display on a Curtiss tractor.

Aircraft Workers at Play.

APART from the usual display of flying at Hendon, a programme of sports for the workers at the various aeroplane factories in the neighbourhood has been arranged for Saturday next, the 24th. There will be running, walking and cycling races, jumping, sack-racing, and pillow-fighting for the men, and egg-and-spoon and skipping competitions for the women workers. Other items include a Directors' and Managers' Handicap, and a race for the band.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

British. *War Office, June 14th.*

"The General Officer Commanding-in-Chief in Egypt reports that a successful air attack was carried out by us yesterday against the enemy camps and aerodrome at El Arish (about 95 miles east of the Canal) and an enemy camp at Bir Mazar (west of El Arish), all of which were effectively bombed. A Fokker which attacked our machines was engaged and driven down.

"On the same day a hostile aeroplane attacked Serapeum (on the canal, north of the Great Bitter Lake), but did no damage and caused only three minor casualties. After this attack the machine attempted to drop bombs on ships in the canal, but without result, and was eventually driven off by our gunfire."

General Headquarters, June 18th.

"In better weather conditions yesterday a great deal of flying was done, and there was marked increase in the activity of hostile aircraft. One of our machines attempted to intercept a hostile reconnaissance, consisting of eight machines, driving one down close behind the enemy's trenches. Our machine was trying to cut off the remainder, engaged the rear machine, and drove it down a few miles behind the enemy's lines.

"In all there were thirty combats in the air, but no other decisive results except this aerial activity. The last twenty-four hours have been quiet."

General Headquarters, June 19th.

"The chief point of interest to record is the aerial report of yesterday, when there was a marked increase in the work undertaken by hostile aircraft.

"In all there were twenty-seven combats, in which the enemy suffered the following losses: One hostile aeroplane was brought down in our lines near Doullens, and the occupants were made prisoners.

"Two of our fighting aeroplanes encountered two Fokkers in the vicinity of Lens. One of the hostile machines was driven down damaged; the other was shot down and crashed to earth from 4,000 feet.

"In other fights in the air two other German machines were driven down in a damaged condition and one was brought down near Wingles. Hostile reconnaissances which crossed the lines in force were attacked and dispersed by our aeroplanes.

"One of our pilots reports seeing two hostile machines hit by anti-aircraft fire. As the results of combats in the air two of our machines were brought down in the enemy's lines."

French. *Paris, June 17th. Afternoon.*

"On the night of the 16th three enemy aeroplanes bombarded the region of Dunkirk. Nobody was injured and little damage was done.

"At 8 o'clock in the evening Bar-le-Duc was bombarded by enemy machines. There were four killed and some 15 wounded among the civilian population. Late in the evening a number of bombs were dropped upon Pont-à-Mousson by German aeroplanes without any result.

"On the night of the 16th one of our bombarding squadrons dropped 29 shells of 120 millimetres and four of 155 millimetres on the railway stations of Longuyon, Montmedy and Audun le Roman."

Paris, June 17th. Evening.

"Bar-le-Duc was again bombarded in the course of the afternoon. The bombs dropped caused slight material damage, and some persons were wounded."

Paris, June 18th. Afternoon.

"On the Verdun front our aviators fought a number of engagements with German machines sent to bombard Bar-le-Duc. In the course of these engagements two enemy aeroplanes were brought down, one near Malancourt, the other near Sammogneux. Three other German machines caught by machine gun fire at close quarters were compelled to come down vertically, the first at Fresnes, the second at Septsarges, the third in the outskirts of Bettancourt.

"In Lorraine four of our machines gave battle to four Fokkers above the enemy lines. Two of the latter were brought down to the east of Bezanges, one of them falling in flames. One of our machines was compelled to alight.

"Our bombarding squadrons have also shown great activity. Twenty-four shells were dropped on enemy depôts near the Semide railway station (Vouziers district), twenty big-calibre shells on factories at Thionville—where two explosions were noted—and a score of projectiles on the aviation establishments at Etain and Ternière.

"In the course of the night enemy machines dropped bombs on Pont-à-Mousson, Nancy, and Baccarat. The material damage was insignificant. One person was wounded at Baccarat."

Paris, June 19th. Afternoon.

"During the night of 18th–19th two of our air squadrons successively bombarded the barracks and railway station of Vouziers, where movements of trains were reported. One squadron dropped thirty-six projectiles of large calibre, the other twenty-five."

Paris, June 19th. Evening.

"An enemy air squadron dropped numerous projectiles on a village to the south of Verdun, where there was a camp of German prisoners. Several of the latter were killed or wounded."

Belgian. *Havre, June 15th.*

"*Congo, E. Africa.*—Flying Lieuts. Belhaeghe and Collignon in a seaplane flew over a German fort at Kigoma on June 10th and bombarded a German gunboat, the 'Graf von Gotzen.' Two of the bombs hit their mark, inflicting serious damage on the vessel."

Russian. *Petrograd, June 16th.*

"A hostile aeroplane has dropped bombs on Tarnopol."

Italian. *Rome, June 13th.*

"During the night of the 11th inst. some enemy hydroplanes dropped bombs on Venice, causing very slight damage. One woman was killed, however, and four civilians were injured.

"At dawn on the same day our torpedo boats approached a place on the Istrian Peninsula, and after carrying out a reconnaissance bombarded an important point near Parenzo.

"After carrying out the operation our torpedo boats were persistently but vainly attacked on their return journey by five enemy hydroplanes. All our ships returned to their base without loss. One of the vessels was struck in the forward part in the operations on the coast, but the damage done was only very slight and was quickly repaired.

"On the morning of the 12th inst., in the Upper Adriatic, one of our hydroplanes, after repulsing an attack by an enemy machine, dropped bombs on the military establishments near Trieser, in spite of the lively fire of the Austrian anti-aircraft batteries."

Rome, June 15th.

"Squadrons of Caproni aeroplanes bombarded with excellent result the railway station of Mattarello (Lagarina Valley) and encampments at the junction of the Nos and Campomulo Valleys (on the Asiago Plateau). Enemy aeroplanes dropped bombs on Padova, S. Giorgio di Nogaro, and Porto Rosega. Two persons were wounded, and the damage was very slight."

Rome, June 16th.

"The enemy, shaken by the first counter-attacks of our troops, and having learned the movements of our reserves by means of aerial reconnaissances, attempted to profit by the few units at his disposal which were still intact, and above all by the large quantity of guns and ammunition which he possessed. . . . ."

Rome, June 17th.

"Hostile aircraft dropped bombs on various points of the Venetian plain, on the town of Padoa, killing three persons and wounding eight.

"On the 15th six of our Caproni aeroplanes bombarded the railway station of Mattarello, in the Adige Valley. Yesterday a squadron of 37 Capronis and Farmans dropped 160 bombs and 60,000 arrows on enemy encampments north of Asiago and in Nos Valley. The whole squadron returned safely. Two hostile machines were brought down."

German. *Berlin, June 13th.*

"Near Podhaijze a Russian aeroplane was overpowered by a German aviator in an aerial battle. The pilot and its observer, a French officer, have been taken prisoners. The aeroplane has been salved."

Berlin, June 14th.

"German airmen during the last few days carried out attacks against the railways behind the Russian front. Troop trains were repeatedly brought to a standstill and railway establishments were destroyed."

Berlin, June 17th.

"The activity of the aviators was lively on both sides. Our squadrons dropped bombs freely on points of military importance in Bergues (French Flanders), Bar-le-Duc, as well as in the sector of Dombasle-Einville-Luneville-Blainville.

"*Balkan Theatre.*—Apart from successful attacks by our aviators on enemy establishments there is nothing of importance to report."

Berlin, June 18th.

"The air attack on military works at Bar-le-Duc was repeated. A French biplane was brought down and destroyed by our anti-aircraft guns west of Lassigny. In the district of Bezanges-le-Grand, south of Château Salins, Lieutenant Wintgens brought down

his sixth and Lieutenant Hoehndopf his fifth enemy aeroplane. The occupants of one machine were killed. On Friday evening the burning débris of a French biplane which had been defeated in an air fight was observed north-east of the Hessen Work."

Berlin, June 19th.

"Two English biplanes were brought down in the course of air fights, one near Lens and the other north of Arras. In each case the enemy aviators were killed. A French aeroplane was shot down in the west of the Argonnes. A German air squadron attacked the railway station, military works and factories at Baccarat and Raoul Etape.

"On the railway lines of Gachowischi Luniniec, which were being used for military transports, numerous bombs have been dropped."

Austrian. *Vienna, June 13th.*

"On Monday morning three enemy torpedo units penetrated into the harbour of Parenzo (in Istria, south of Trieste). They were driven off by batteries and aeroplanes. Their artillery fire remained without result, only a wall and a roof being slightly damaged. Nobody was wounded, while the batteries and the aeroplanes succeeded in scoring hits."

Vienna, June 16th.

"A squadron of seaplanes successfully bombarded on the night of June 15th the railway station and the precincts of Porto Gruaro and Latisana, the railway line between Porto Gruaro and Latisana, while a second squadron attacked the railway station and military works at Motta di Livenza, and a third squadron the enemy positions near Monfalcone and other places. Several effective hits were observed in the railway stations and military positions, and fires were seen to break out. Despite a heavy bombardment, all the aircraft returned safely."

Bulgarian. *Sofia, June 14th.*

"In the afternoon four of our aeroplanes attacked the ships with bombs and forced them to retire at full speed in the direction of Thasos (an island six miles to the south). Our aeroplanes, although vigorously but ineffectively fired at by the enemy artillery and machine guns, returned safely. The bombardment of the coast caused us no losses."

Sofia, June 19th.

"For some time the French and English have been destroying the harvest by means of incendiary bombs. Yesterday in the neighbourhood of the villages of Zineli and Tarachmanli, at the mouth of the Mesta, four enemy aeroplanes threw some special bombs for setting fire to the fields, and caused some fires, which were immediately extinguished.

"Yesterday evening an enemy aeroplane threw five bombs on the town of Bitolia. Two civilians were slightly wounded, while the material damage was insignificant."

Turkish. *Constantinople, June 13th.*

"Yesterday morning five hostile aeroplanes dropped about 50 bombs on Smyrna, killing some men, women, and children, and destroying some houses."

Constantinople, June 15th.

"Two gunboats were destroyed by our artillery and are completely submerged in the Tigris, as has been established by our airmen.

"On Sunday last our aeroplanes attacked with bombs and machine-guns an English camp on the Suez Canal, near Reman and Kantara, and caused great disorder. They also attacked a British seaplane, and forced it to return to the mother ship."

The well-known German Fokker pilot Lieutenant Immelmann, who is credited with having brought down a number of British machines.

Constantinople, June 17th.

"We drove off by our fire two enemy aeroplanes and two torpedo-boats which attempted to approach Sedd-ul-Bahr.

"On June 13th, two enemy airmen, who unsuccessfully bombarded El Arish, were driven off by our battleplanes. Our airmen successfully replied by an attack on an enemy aerodrome, and returned safely."

Constantinople, June 19th.

"A torpedo boat and two enemy aeroplanes which were observed near the island of Kuesten (Makronisi) were driven off by our fire."

From Other Sources.

Mr. G. Ward Price, writing to the *Times* from Salonica on June 12th, says:—

"French airmen dropped bombs to-day on Fort Rupel, which the Bulgarians recently seized from the Greeks. The airmen believed that they did considerable damage."

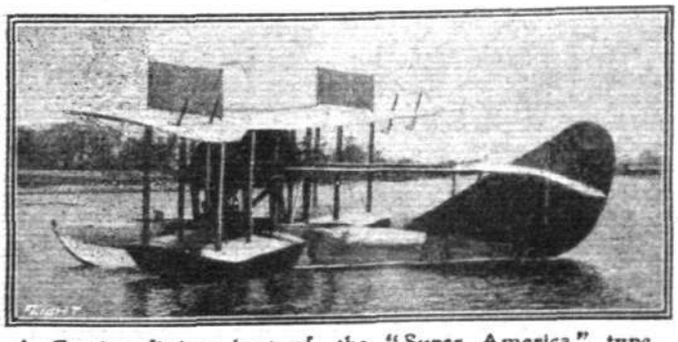
A message from the *Times* correspondent at the same place on June 14th says:—

"German aircraft to-day threw some bombs on the Allied positions at Gumendje. On the other hand, French air flotillas bombed enemy camps at Negortzi, Strumnitza, Petritch, and also Strumnitza railway station while supplies were being unloaded from a military train."

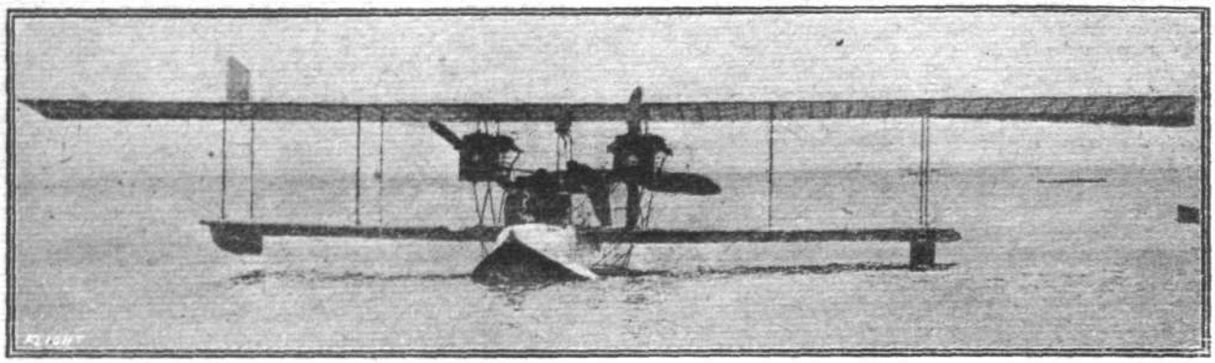
Correspondents of Berlin papers on the Russian front report that a large number of French airmen who recently arrived in Moscow are now flying on the Galicia and Volhynia front, while several hundred French aeroplanes, it is said, have arrived along the whole Russian front.

Mr. G. Ward Price, writing to the *Daily Telegraph* from Salonica on Saturday, said:—

"Besides a heavier cannonade than usual on the French sector of the front, the past day or two has been not ceable for greater activity by flying men, both on our side and the enemy's. Enemy airmen bombed both banks of the Vardar River, in the hope of finding billets in French camps, while our aeroplanes carried out several useful and lengthy raids. The French, for instance, have been bomb-dropping over Monastir, Kuprulu, Petrich, and Doiran.



A Curtiss flying boat of the "Super America" type, presented by Mr. Glenn Curtiss to the American Coast Guard, who will employ it for "spotting" and reporting the location of derelicts.



Front view of the Curtiss "Super America" flying boat, which carried eight passengers during her trial tests at Newport News, Virginia.

English flying men from the island of Thasos raid Bulgarian territory near Xanthi and Porto Lagos almost daily, and yesterday made a number of direct hits on a large enemy camp at Coban Mah, near the Mesta River. One result of the bombs was that large fires broke out amongst the crops. The airmen have thus done something towards depriving the enemy of stocks of food, which might otherwise enable him to prolong his resistance.

"High regard should be had for these Allied airmen in the Balkans. They fly over most dangerous country. Places where, in case of engine breakdown, it would be possible to land are rare indeed in such mountainous country. They start off on long tours, often at night, knowing that the slightest panne will mean certain death, and fly 100 or 150 miles, with no better guidance than a pocket electric torch, occasionally flashed on the dials of their instruments. Nor is their gravest danger over when they reach home before dawn. With the best skill most serious accidents can take place while landing. Allied seaplanes, too, make long oversea flights entirely unescorted. Some of them have had breakdowns and alighted, fortunately, near an island, where a searching destroyer sent out to look for them has picked them up."

The *Daily Telegraph* correspondent in Rome, writing on June 19th, says:—

"Austrian prisoners of war state that the situation of the Austrian army in the Trentino is critical on account of the enemy railway having been subjected to destructive aerial bombardment. The bringing up of supplies for the troops is difficult owing to the lack of vehicles and motor cars, many of which have been sent to the Russian front."

More Aeroplanes from the Malay States.

SIX more aeroplanes for the Royal Flying Corps have been provided with £13 500 collected in the Straits Settlements and Federated Malay States.

Warneford Memorials.

A MONUMENT, publicly subscribed for, is shortly to be erected in Brompton Cemetery to the memory of Flight Sub-Lieutenant R. A. J. Warneford, V.C., who a year ago—on June 24th, 1915—destroyed a Zeppelin near Ghent.

Another memorial is to be placed in the Warneford Chapel in Highworth Church, Wiltshire. This is to be the family tribute, and subscriptions have been collected from surviving members of the old family of Warneford.

The Naval Battle.

AN article in the *Scotsman* says that comment is made by neutrals as to "the Kaiser's seeming anxiety on this occasion to bring his surface ships into the light of German favour, to the exclusion of the submarines and the airships, which, it may be presumed, already enjoy their full share of the public favour and faith. Thus the world was informed from Germany that no submarines took part in the battle, and Friedrichshafen had just begun to celebrate the part taken by Zeppelins in the action when, by order, the celebration was centred on the deeds of the Navy alone. Friedrichshafen knew better, but obediently transferred to the navy the praise which it had worked up for the Zeppelins."

A "middie" in one of the Grand Fleet battleships in a breezy letter home says:—

"We engaged a Zepp. which showed an inclination to become pally. I think it thought we were Germans. Altogether it was some stunt. . . . . At about three a.m. we sighted a Zepp. which was vigorously fired at. It made off 'Quam celerrime,' which means quick with a capital Q."

British Submarines and German Seaplanes.

THE Danish paper *Politiken* reports that a fight took place on the afternoon of June 15th between a British submarine and a German seaplane outside Ystad, off the coast of Scania. The seaplane endeavoured to drop several bombs on the submarine, which, however was not hit, but drove the seaplane off in a damaged condition.

The same paper also states that the crew of the Danish steamer "La Cour," which arrived at Copenhagen on June 19th, report that they met a British submarine about noon on Sunday in the Kattegat, between the islands of Anholt and Læsö. Two German seaplanes appeared and dropped bombs, but without hitting the submarine. The submarine then fired at the seaplanes, one of which was shot down and the other put to flight.

Zeppelins after British Submarines.

ACCORDING to the Danish *Politiken*, on Sunday afternoon two Zeppelins passed over the Sound and were seen in the Kattegat going very slowly, apparently searching for British submarines. The Danish schooner "Edith," on a voyage to Raumo with a cargo of contraband, was chased by one of the Zeppelins, but she escaped inside Swedish waters.

Another Zeppelin Reported Wrecked.

A REPORT was received in Amsterdam from the Belgian frontier that a Zeppelin was wrecked by the wind at Chatelineau, south Belgium (on the river Sambre, between Namur and Charleroi), on Monday. The Zeppelin was dashed against the telegraph wires and there was an explosion. Of 18 men who were aboard, two were severely wounded, whilst others received slight injuries. The Zeppelin, which was said to be of the latest type, was destroyed.

Captain Boelke's Fate.

THE *Matin* states that Captain Boelke, who until recently shared with Lieut. Immelmann the distinction of being prominently mentioned in German *communiqués*, has been shot down by Flight Adjutant Roger Ribiere on the Verdun front.

A Mid-Air Collision in France.

A REPORT from Paris on June 18th states, a collision occurred at Pantin between two aeroplanes at a height of about 6,000 ft. The two machines crashed to the ground, but both aviators miraculously escaped uninjured.

Germans Bomb Hospital Trains.

SPECIFIC instances of attacks by German aircraft on Red Cross trains and hospitals are given in the report of the Russian Commission of Enquiry into the atrocities perpetrated by German troops. Here are a few out of a long list:—

"April 11th, 1915.—Hospital bombed by aeroplane, despite large flag.

"April 17th, 1915.—Hospital exclusively bombed by flotilla of airships. Doctor and Sister of Mercy injured.

May 6th.—Hospital train bombed whilst standing at Toyekhanor. Six bombs deliberately thrown on it, although the Red Cross was exhibited on the roofs of the railway carriages. Four of the wounded were killed."

Details are given of many similar incidents. In one case of the bombing of an automobile column of wounded the attack was "undoubtedly premeditated and intentional." Hostile aeroplanes had been seen in the locality for several days apparently watching for the evacuation of the wounded.

A graphic story is told of an engine driver, who regulated the speed of his engine and managed to save his Red Cross train from three aeroplanes that attacked it. Bombs dropped before and behind, but the driver's efforts prevented them finding their mark. Red Cross flags were displayed, and crosses painted on the tops of the carriages.

PERSONALS.

UNDER the above heading will be published weekly particulars of a personal character relating to those who have fallen or have been wounded in the country's service, announcements of marriages and other items concerning members of the Flying Services and others well known in the world of aviation. We shall be pleased to receive for publication properly authenticated particulars suitable for this column.

Casualties.

Second Lieutenant R. A. STUBBS, Royal Munster Fusiliers and R.F.C., met his death on June 8th ten days after flying across to France. He was conducting an early morning patrol over the German lines when his aeroplane was shelled by the enemy. It was not definitely known whether the aviator was hit, for he continued his patrol for an hour afterwards. He then fell and was instantly killed on descending within the British lines. The deceased officer was at Keble College, Oxford, studying for Holy Orders, when war broke out, and immediately joined the University and Public Schools Corps. He received his commission in the Munsters in May, 1915, and joined the R.F.C. in November last, gaining his "Wings" in March.

Married and to be Married.

An engagement is announced between Lieutenant GRAHAM SHURMUR BUSH, R.F.C., youngest son of Mr. and Mrs. Philip Bush, Old Manor House, Keynsham, Somerset, and MILDRED STURGE HITCHENS, only daughter of Mr. and Mrs. Ernest Hitchens, of "Abbotsford," Wadham Gardens, London, and Yate, Glos.

An engagement is announced between EDWARD CHARLES COLMAN, Second Lieutenant, Wiltshire Regt. and R.F.C., eldest son of Mr. and Mrs. Colman, of The Inglenook, Kingston Hill, and ENA HESELTINE, only daughter of the late ARTHUR HESELTINE LITTLE, of Southport, and Mrs. HERBERT J. HANSON, and step-daughter of Mr. H. J. Hanson, of 176, Oakwood Court, Kensington.

The engagement is announced of IVAN MARIO MACKENZIE, Flight Sub-Lieutenant, R.F.C., son of Mr. and Mrs. Evan Mackenzie, of Genoa, Italy, and MARGERY, elder daughter of Mr. R. J. LAWRENCE, of the Inner Temple, and Mrs. LAWRENCE, of Eversleigh, Wolverhampton.

The engagement is announced of Second Lieutenant W. WITCOMB STAINER, 4th Batt. The Royal Sussex Regt. and R.F.C., only son of Mr. and Mrs. W. J. Stainer, of Hove, Sussex, to BEATA GWENLLIAN, younger daughter of Mr. and Mrs. W. KILMISTER, of Edinburgh and Brighton, Sussex.

The engagement is announced of Captain A. CLAUD WRIGHT, R.F.C., son of Mr. and Mrs. A. A. Wright, of Acton Hill, and ELISE, elder daughter of Mr. and Mrs. J. B. RODWELL, of Pegula, Teignmouth.

Items.

MURIEL VISCOUNTESS HELMSLEY opened last week at Conewood, Camberley, the first summer holiday crèche to be established in the United Kingdom by the National Society of Day Nurseries. Twenty-three cots have been given at the crèche, one of them being "The Heroes' Cot," in loving remembrance of Captain Robert E. Forrester, 2nd Batt. The Black Watch; Captain Humphrey Talbot, 4th Dragoon Guards; Samuel Pepys Cockerell, Royal Flying Corps; Major Lord Desmond FitzGerald, Irish Guards; Captain F. Grenfell, V.C., 16th Lancers; Private H. Barber, 2nd Suffolk Regiment; Private A. J. Ricketts, 1st Wiltshire Regiment; and Private A. H. Keeling, Motor Transport, Army Service Corps.

The will has been proved at £2,750, gross value, of Captain CLAUDE ALLAN GILBERT LINDSAY HAMILTON FARIE, Highland Light Infantry and R.F.C., of Tregunter Road, South Kensington, who died on March 15th from wounds received in action.

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Robinson and Cleaver's Sale.

THE great summer sale which commences at Robinson and Cleaver's on Monday next offers an opportunity for officers in both flying services to secure equipment at reduced prices. It may be recalled that for some time now this well-known firm have had a special department for dealing with the requirements of flying officers, and this branch of the business shares, together with the other sections which are given over to the needs of the gentler sex, in the advantage of having reduced prices throughout July. A list giving a selection of the chief bargains which are available has been published, and a copy can be had by any of our readers on application to the Linen Hall, 156-170, Regent Street, W.

To Keep Windscreens and Goggles Clear.

ONE difficulty which is experienced with windscreens, whether used on aeroplanes or motor cars, is the film of water which forms and obscures the view. A similar difficulty is experienced with goggles, but in both cases it is possible to obviate the trouble by the use of "Glasso," a paste which is put up in small tins. It is very lasting; a little goes a long way. The smallest quantity of the paste is simply smeared on the glass and then rubbed off, leaving the surface perfectly clear and polished. The result is that any moisture which forms on the glass immediately runs off. Testing the paste on a motor car windscreen during the recent wet weather, we have found that the screen keeps perfectly clear when driving through rain. The makers—the Glasso Manufacturing Co., 211, City Road, London, E.C.—have also experimented with oil, and find it is repelled in a similar way. During the next few days a demonstration is being given at Gamages', in Holborn, the steam from a kettle being allowed to impinge on a sheet of glass, one-half of which has been treated with Glasso while the other half is untreated, and the result is very convincing. The paste is put up in convenient tins at 6*d.*, 1*s.* and 2*s.* 6*d.* each, and it can be used for many purposes besides those mentioned above: periscopes, binoculars and eye-glasses will benefit by its use, while not the least useful of its applications is to shaving glasses.

Fluxes for Acetylene Welding.

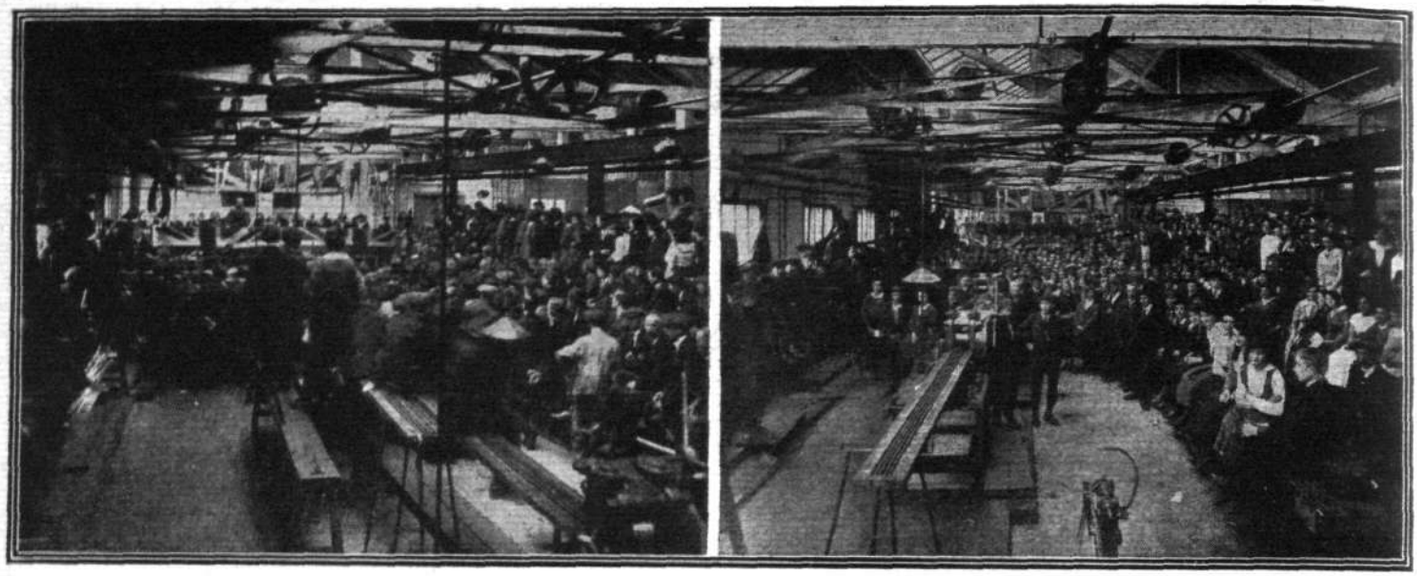
FROM time to time in these columns we have drawn attention to the necessity of seeing that every precaution is taken in connection with oxy-acetylene welding to ensure that only the best materials are used, and that every step in the process is thoroughly carried out. This applies especially to the fluxes which have to be used, and which vary, of course, with the metals operated upon. From their experience as experts in the art of oxy-acetylene welding and cutting, Imperial Light, Ltd., of 123, Victoria Street, London, S.W., have become specialists in the supply of the necessary fluxes for aluminium, copper, brass, Delta metal, phosphor bronze, cast iron, &c., these being sold under the name of the Sunflower Brand. The firm also supply all items of equipment as well as complete plants for oxy-acetylene welding, besides undertaking repair work by this process at their works at New Road, Battersea, London, and Broadgate, Lincoln.

Aerolite Alloy Pistons.

As a result of their extensive experience with aluminium alloy pistons in the engines of racing cars, the Aluminium Piston Co., of Hanover Court Garage, are specialising in pistons made of a special alloy which has been called "Aerolite." It is claimed that while "aerolite" alloy has a strength equal to cast iron, and while a piston made of it shows a saving in weight from one-half to two-thirds, there is no tendency to warp as experienced with steel pistons, and the high heat conductivity of the metal overcomes any tendency to preignition and in many cases allows the compression of the engine to be raised, thus enabling it to develop more power.

"Aerolite" is a hard metal, and is said to wear as well as cast iron, which cannot be said of aluminium alloys in which magnesium, zinc, or tin enter into the composition. The firm are ready to place their experience as designers at the disposal of manufacturers who contemplate using aerolite pistons.

How Messrs. Dunkleys, Ltd., the well-known Birmingham manufacturers, pack up the batches of aeroplane landing wheels which they are turning out for Russian use.



Photos. by Argent Archer.

OPENING OF THE Y.M.C.A. MUNITION WORKERS' CANTEEN AT THE ROTAX WORKS.—On the left, the formal opening ceremony in progress, the photographer being silently at work at the back. On the right, the "rightabout" of the employees, "diluted" and otherwise, to face the camera manipulator.

AN IMPROVEMENT AT THE ROTAX WORKS.

WITH the considerable recent additions to the premises at Willesden Junction, and consequent additional staff, the Rotax Motor Accessories Co. have found it desirable to erect a large canteen so that their workpeople and staff can be provided with meals and refreshments at a reasonable cost. The canteen, which cost the firm several hundred pounds to erect, will accommodate about 400 people at a time, is organised and run by the Y.M.C.A., and meals are supplied at cost price.

At the official opening on June 14th, Major-General Sir Francis Lloyd, K.C.B., C.V.O., D.S.O., made a rousing speech to the workpeople, pointing out the vital importance of their work, and incidentally congratulated the Rotax Co. on the small percentage of eligible men they employed.

Mr. A. Yapp, National Secretary of the Y.M.C.A., related several of his experiences at the front in France, which were greatly appreciated.

Mr. E. Aron made an admirable chairman at the meeting, which was held at 6.30 p.m., so as not to interfere with the work, and to give the night shift an opportunity of attending.

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A Popular Subject.

BOOKS on the subject of aviation are in much demand at the Islington Central Library.

The U.S. Navy and Aviation.

IN the report of the Committee on U.S. naval estimates it is stated :—"It is contemplated that the $2,000,000 recommended, in addition to providing for other aviation service, will eventually bring the number of service machines up to seventy-five, and as soon as the various ships are fitted up, the machines will be put upon them. It must be remembered that the principal function of aviation for naval purposes is scouting in connection with the fleet, and for this purpose $2,000,000 at this time is deemed sufficient."

U.S. Naval Pupil Killed.

WHILE making a flight at Pensacola on May 24th, the machine of Lieut. James V. Rockwell, a pupil at the naval school, dived into the sea from a height of 150 feet, and the pilot was instantly killed.

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PUBLICATIONS RECEIVED.

All About the German Navy. By Fred T. Jane. London: Sampson Low, Marston, and Co., Ltd. Price 1s. net.

First Annual Report of the National Advisory Committee for Aeronautics, 1915. Washington, U.S.A.: Government Printing Office.

Some Aspects of the War as Viewed by Naturalised British Subjects. By August Cohn. London: The Council of Loyal British Subjects of German, Austrian, or Hungarian Birth, 13, Clifford's Inn, E.C.

All the World's Aircraft: War Flying Annual. Founded and edited by the late Fred T. Jane. London: Sampson Low, Marston, and Co., Ltd. Price 21s. net.

NEW COMPANIES REGISTERED.

Bournemouth Aviation Co., Ltd., 1C, King Street, St. James's, S.W.—Capital £6,000, in £1 shares. Acquiring business carried on at Talbot Village, near Bournemouth, as the Bournemouth Aviation Co. First directors, F. E. Etches, H. E. Aldridge, and R. J. Vine.

E. R. Calthrop's Aerial Patents, Ltd., Eldon Street House, Eldon Street, E.C.—Capital £60,000, in £1 shares. Acquiring from E. R. Calthrop certain inventions relating to aircraft accessories, manufacturers of and dealers in aerial conveyances and aircraft of all kinds, &c. First directors, E. R. Calthrop and Sir John A. Atkinson.

Davidson Aviation Co., Ltd., 231, Hammersmith Road, W.—Capital £10,000, in £1 shares. Builders and makers of aeroplanes, motor boats, and accessories therefor, &c. First directors, W. Stewart-Greene and W. E. Chester.

Spad Aircraft Co., Ltd., 30, Golden Square, W.—Capital £100, in £1 shares.

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Aeronautical Patents Published.

Applied for in 1915.

Published June 15th, 1916.

6,126. SPERRY GYROSCOPE CO. Apparatus for determining speed drift and course of aircraft.

11,466. E. MASSIS. Aircraft.

Published June 22nd, 1916.

7,872. — MILLS. Appliance for use in attacking aerial craft and submarines, &c.

11,279. — WANLISS. Guns for use against aeroplanes, &c.

Applied for in 1916.

The numbers in brackets are those under which the specification will be printed and abridged, &c.

Published June 15th, 1916.

5,870. SOC. ANON. DES ETAB. NIEUPORT. Skids for aeroplanes. (100,320.)

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44, ST. MARTIN'S LANE, LONDON, W.C.

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